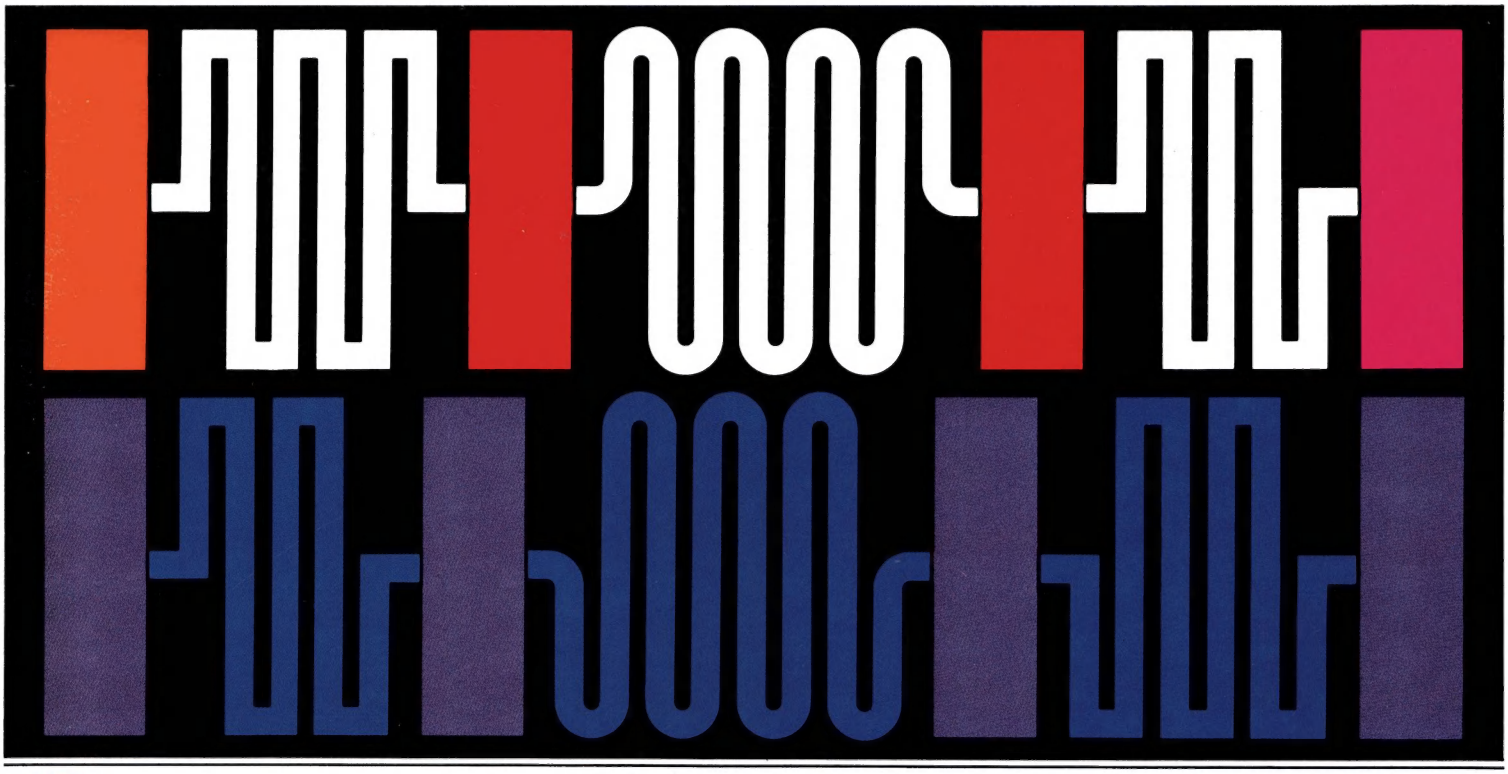
Telecom

Datel Service

Facilities

June 1987

Telecom – the major force in data communications



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1. FOREWORD

The information contained in this handbook has been prepared to assist customers in their understanding and knowledge of data communications, specifically in relation to Telecom Australia's Datel Services. Because of the highly technical nature of those services, it was necessary to include brief explanations of the basic datacom network components in Sections 4, 5 and 6. These sections will provide the background to Section 7 which outlines the facilities offered in the Datel Product range. In addition, a glossary of the most commonly used terms applicable to the data communications industry is provided towards the end of the handbook. The growth of data communications in Australia and the rapid change in technology have produced a dynamic situation wherein Telecom Australia's datacom services are constantly upgraded, and its policies continually reviewed to serve customer requirements. Telecom Data advisers are available to provide the latest information in more detail, where required, on any aspects of its Datel Services, as well as on its other Data Communication Services – Digital Data Service (DDS) and AUSTPAC.

2. INTRODUCTION TO TELECOM AUSTRALIA'S DATEL SERVICES

Data communications (Datacom) is the transmission and distribution of information in data format between computers using telecommunication facilities.

In essence, it represents the convergence of two technologies, computer power and telecommunications, to eliminate distance and time as major factors in the collection and use of the huge amounts of information confronting us today.

With Telecom Australia's Datel Services, rapid communication is provided between computers and remotely located terminals, using circuits of a standard speech bandwidth (or of a wider bandwidth, if required).

A Datel Service includes this connecting circuit, together with a modulator/demodulator (modem) necessary to translate the data into a form suitable for transmission over the circuit. The data is restored to its original form by another modem at the distant end before being presented to the computer or terminal.

Telecom end-to-end maintenance is an integral part of the Datel Service.

Applications

Depending on your data communication requirements, Datel Services can be provided either on the Public Switched Telephone Network or on Privately Leased Datel lines and are flexible enough to cater for such applications as:

- General Management – the general purpose processing of financial and other management information (including financial accounting, invoice and billing, order processing, management accounting, etc.) for the normal operation of all types of enterprises.
- Information Retrieval – accessing computer service bureaux (both commercial and public sector) to use specialised application software for technical analysis and financial modelling.
- Stock and Production Control – maintaining up-to-date records of goods, stocks and products, and producing replenishment listings of orders for suppliers and production facilities.
- Travel and other Reservations – enabling remote branches and customers at dispersed locations to make enquiries and bookings for travel, accommodation and entertainment.

3. STANDARDS

Clearly, there is a need for standards to ensure compatibility between terminals and modems, between modems from independent organisations, between national networks, etc. It is desirable that these standards be internationally accepted and that they should facilitate international transmission.

Among the many organisations active in the field of international standards, the two which concern us most are the International Telegraph and Telephone Consultative Committee (CCITT) and the International Standards Organisation (ISO). The CCITT is one of several permanent organs of the International Telecommunications Union (ITU), a special agency of the United Nations whose aims are to promote international co-operation for the use of telecommunications, and to harmonise the actions of nations in this field.

CCITT Recommendations cover such topics as data transmission and tariffing principles, and are generally followed by Telecom (itself an active member of CCITT) in its provision of Datel Services.

Potential users and suppliers of data equipment in Australia should check that such equipment conforms with these international standards, because compatibility problems may arise. Telecom Data advisers can provide further information on this matter, or you can write to Legal & Policy Branch, Regulatory Engineering Standards Section whose address is provided at the back of this book.

4. NETWORK COMPONENTS

To understand the role of telecommunications in the transmission of data between computer terminals, it is necessary to have an understanding of the basic operation of the network components. Before outlining those components of direct relevance, please refer to Fig. 1 which contains a set of common symbols used in the explanatory diagrams described throughout the booklet.

Terminals

A terminal, strictly speaking, is any computer equipment in a network where information can enter and exit. This means that a computer can be classed as a terminal. For clarity, however, a user's input/output (I/O) device (e.g. keyboard, video display unit, line printer) will be referred to as a terminal or data terminal equipment, and the other end of the line will be called a computer.

Modem

Data Terminal Equipment (DTE) transfers information in a digital format, a two-level voltage, whereas telephone lines transport information in an analogue format. It is therefore necessary to convert the digital data into analogue form for transmission over telephone lines. This is performed by the modem, the word being a contraction of the two functions performed by it – modulation and demodulation. (Please refer to the Glossary for definition of these terms.)

Modem Interface

The interface is the circuitry used to interconnect the DTE (Data Terminal Equipment) and the modem. Basically it ensures three things:

1. That the voltage and signal levels are compatible;
2. That the various function interface connectors can be plugged together (mated with identical pin wiring and corresponding pin connections); and
3. That certain control information supplied by one device is understood by the other device.

The standard interface connections between the DTE and the modem have been specified by the International Telephone and Telegraph Consultative Committee (CCITT). The CCITT "V" Series of the recommendations specify connections between the modem and DTE, and between the modem and line on conventional leased and switched telephone networks. Circuit functions and connections between the DTE and modem are specified in the V24 standard. Recommendation V28 specifies the electrical characteristics. Together these recommendations are functionally equivalent to the United States of America's Electronic Industries Association (EIA) RS-232-C interface. The pin and socket positions on the 25-way adaptor which connects the modem and DTE are specified by International Standards Organisation (ISO)

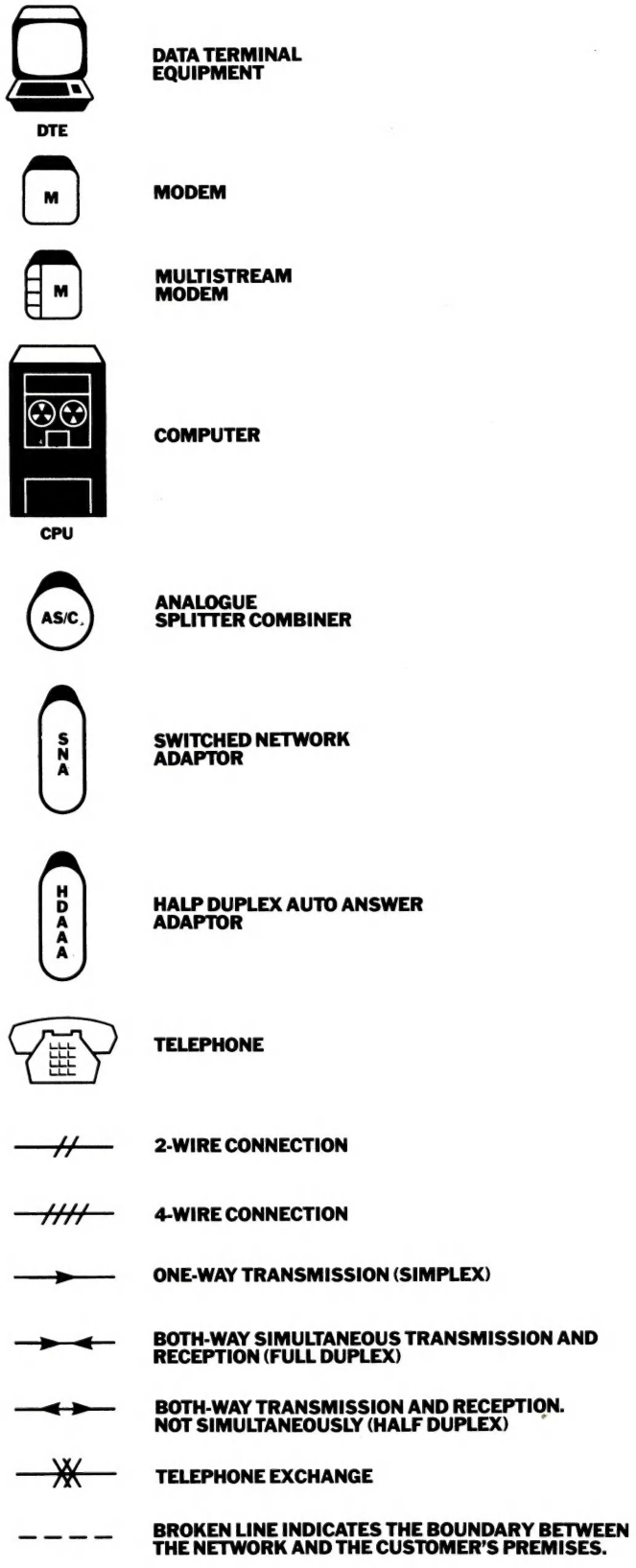


FIGURE 1 – SYMBOLS USED IN EXPLANATORY DIAGRAMS THROUGHOUT THE BOOKLET

recommendation No. 2110. The CCITT circuit numbers together with their functions, the RS-232-C equivalent assignments, and signal directions are listed in Appendix A. There is also a listing and a brief description of the CCITT recommendations in Appendix B. V series recommendations refer to analogue transmission standards and X series to digital transmission.

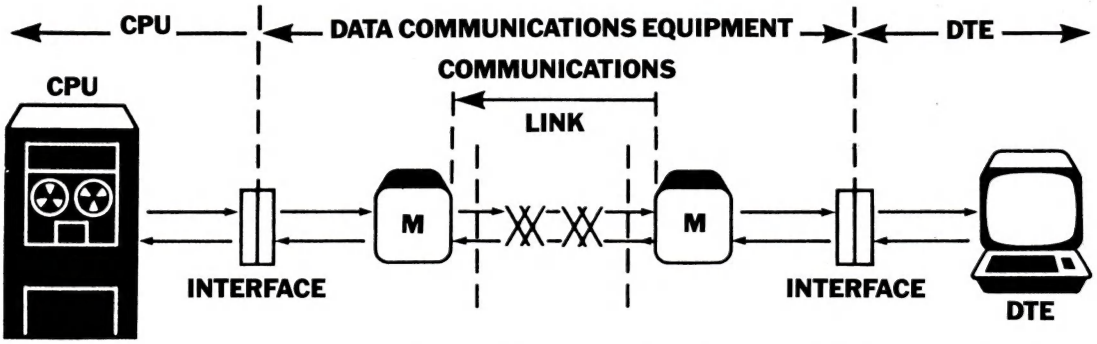


FIGURE 2 – BASIC COMPONENTS OF A DATA COMMUNICATIONS NETWORK

Types of Lines

With Datel Services, two basic types of lines are used for the transmission of data. These are the Switched Network and Privately Leased or Dedicated Lines.

☐ Switched Network Lines

Telephone exchange lines, which have a bandwidth of 300 to 3400 Hz, are primarily designed for voice communications, but can also be adapted for data transmission by the use of modems (see MODEM, page 3). Please note that for the Switched Network service the associated telephone should be a Telecom provided standard telephone, a Datelphone, or a Datelplinth in association with a standard telephone. There are now many types of non-standard telephones or small business systems which do not meet engineering requirements for use in conjunction with a DXL (Datel Exchange Line) service.

The switched channels provided on the Public Switched Telephone Network (PSTN) are basically 2-wire point-to-point circuits, which are established by dialling the distant end and which are held for the duration of a call.

Since a different circuit path is selected each time a call is placed, transmission characteristics may vary from call to call.

It has the advantage of being universally available and is cheaper than leased lines when usage is low.

The current rates at which data may be transmitted over the PSTN are 300, 600/1200, 2400, 4800 and 9600 bit/s. For speeds of 4800 and 9600 bit/s, the data transmission is synchronous and two exchange lines are provided with the Switched Network Adaptor (SNA). (See page 5.)

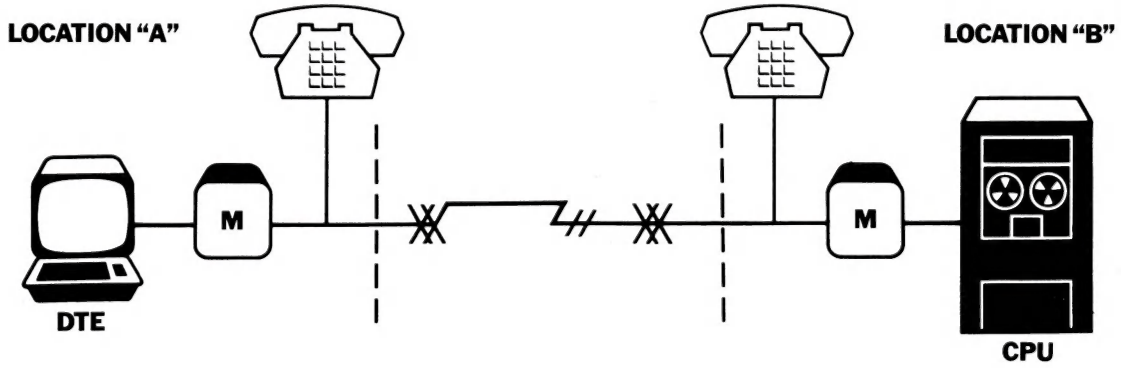


FIGURE 3 – SWITCHED NETWORK DATEL SERVICE

☐Privately Leased Telephone Lines

A privately leased or dedicated line is a permanent circuit for private use within a Datacom network, with the lines being hard-wired through telephone exchanges, independent of the public switching and signalling equipment in those exchanges.

Dedicated lines may be provided on either a 2-wire or a 4-wire basis for point-to-point and multi-point network services as required. (See Section 6 Network Configurations for description of these alternative line configurations.)

These are used for interactive, fast-response applications where switched network connection delays and transmission characteristics are not compatible with the data transmission system requirements and where the volume of traffic justifies their cost.

Data transmission rate ranges from 300 bit/s to 19,200 bit/s.

Wider bandwidth channels are also available, if required, for 48 kbit/s to 72 kbit/s. Alternate voice capability is generally available with dedicated lines.

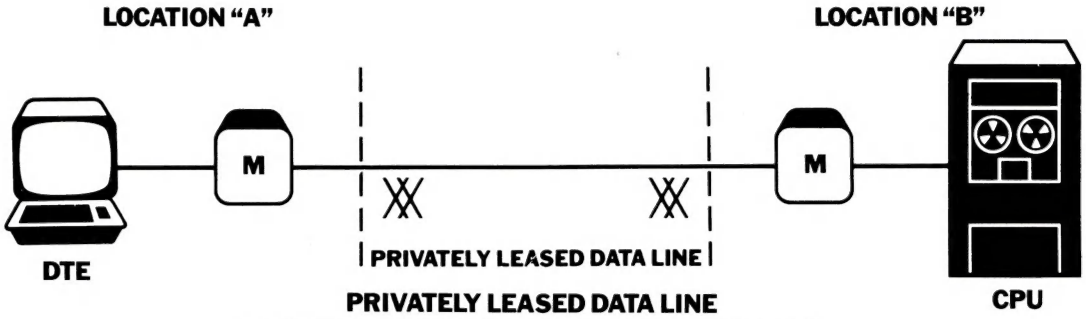


FIGURE 4 – PRIVATE LINE DATEL SERVICE

Switched Network Adaptor (SNA)

This Telecom designed unit is used to interface leased line data modems with the Public Switched Telephone Network (PSTN) thereby expanding the range of services available on the Switched Network. The SNA is used in the 2400 and 4800 bit/s Half Duplex Switched Network Services as shown in Figure 5, as well as in the 2400, 4800 and 9600 bit/s Full Duplex Switched Network Services, which use two exchange lines.

In addition, the SNA is used to provide a Full Duplex Fallback Facility on private line services by switching the modem from 4-wire leased line to switched network lines at the same speed of operation. As shown on page 25, the SNA is used in conjunction with two exchange line services to maintain full duplex operation. Fallback Services are available for the 1200, 2400, 4800 and 9600 bit/s Private Line Long Distance Datel Services.

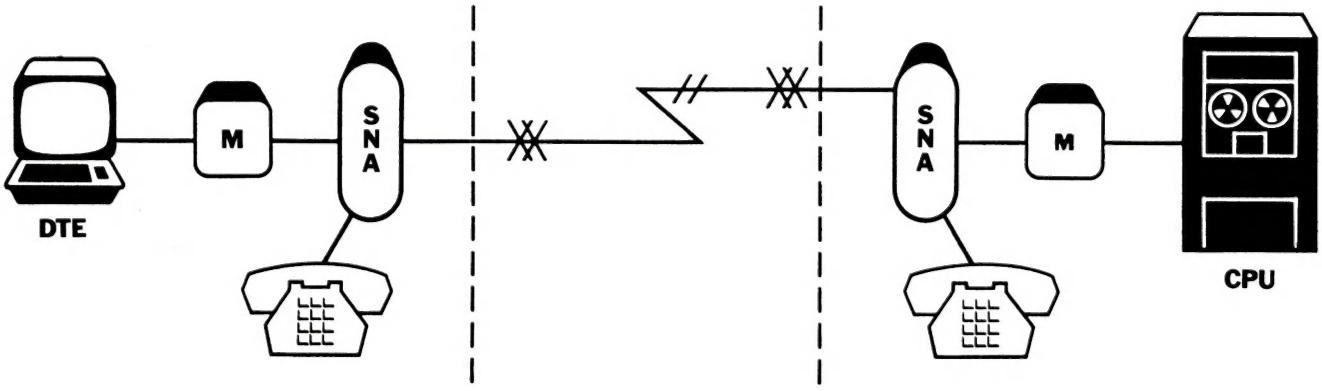


FIGURE 5. SWITCHED NETWORK ADAPTOR (SNA) – HALF DUPLEX SWITCHED NETWORK SERVICE

Half Duplex Auto Answer Adaptor (HDAAA)

The Half Duplex Auto Answer Adaptor (HDAAA) is a device which adapts a suitable 2-wire half duplex leased line data modem for use as an automatic answering modem on the public switched telephone network.

It works with a single-switched service and hence does not support full duplex working. Nor does it provide a means of switching the modem from a leased line to a switched network line.

It is currently used to facilitate auto answering on the 2400 and 4800 bit/s Half Duplex Switched Network Datel Services.

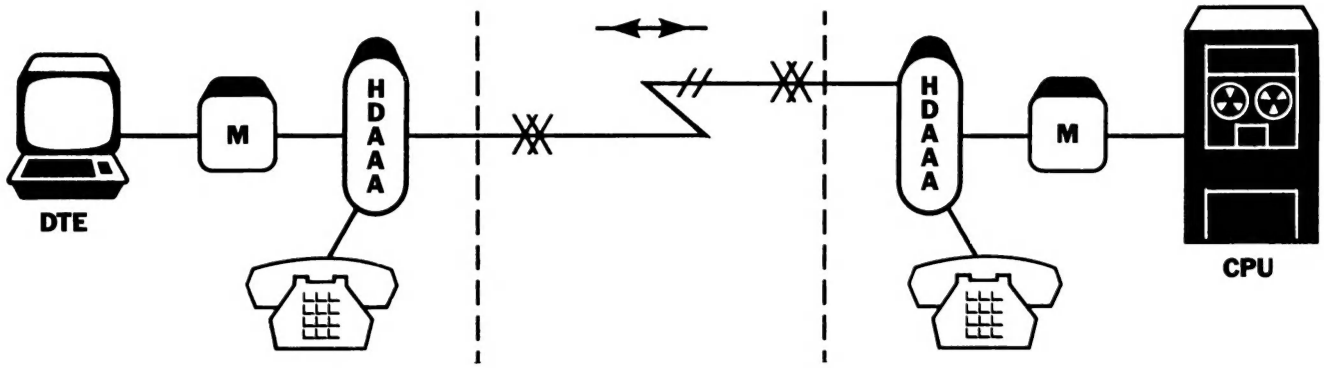


FIGURE 6. HALF DUPLEX AUTO ANSWER ADAPTOR (HDAAA)

The Datelphone/Datelplinth

In many instances, transmission control functions are incorporated within the data terminal equipment (DTE), in which case, Telecom provides a standard telephone with a switched network Datel service. However, where the DTE does not provide its own data transmission control functions, Telecom will supply for a small additional charge, either a specially designed telephone known as a Datelphone, or a plinth unit. This unit sits underneath a standard telephone and is known as a Datelplinth. The Datelplinth offers a wider choice of telephone options to Datel customers. The Datelphone or plinth unit can be configured to provide a combination of control functions required by the customer including:

- phone/data switching – switches the telephone line from telephone to modem and back as required;
- select transmit frequency;
- data signalling rate selection;
- manual/auto answer – enables calls to be answered manually or automatically.

In addition, status lamp displays are provided on the datelphone or plinth unit to indicate for example:

- Data Set Ready
- answer or originate mode.

If a Datelphone or Datelplinth is necessary, your equipment supplier will denote the configuration required on the Authority to Connect form (TS83 or TS76). (See also Section 12. "Applying for a Datel Service".)

DATELPHONE

DATELPLINTH WITH TELEPHONE

FIGURE 7

5. NETWORK OPERATION

Communication Links

Two terms which describe the physical and functional means for electrically transmitting information between two or more points are:

- Line – the physical equipment and media used in telecommunications. A "line" may start and end with a pair but other types of equipment (e.g. microwave relay and/or coaxial cables) may also be used in between.
- Channel – a transmission path within a line through which information flows.

Modes of Operation

The terms simplex, half duplex and full duplex may be used to describe (a) the mode of DTE operation over a data link or (b) an intrinsic feature of a communication line.

The terms "2-wire" and "4-wire" refer solely to an intrinsic line feature and do not necessarily define the mode of operation.

☐ Simplex (or One-Way Operation)

This mode of line usage as shown in Fig. 8 is seldom used in present datacom applications because of the almost universal requirement to exchange data and/or control signals in both directions at one time or another.

☐ Half Duplex (Either Way Operation)

With this mode, transmission may be in either direction but not in both directions simultaneously. A DTE operating in the half duplex mode may use either 2-wire or 4-wire facilities.

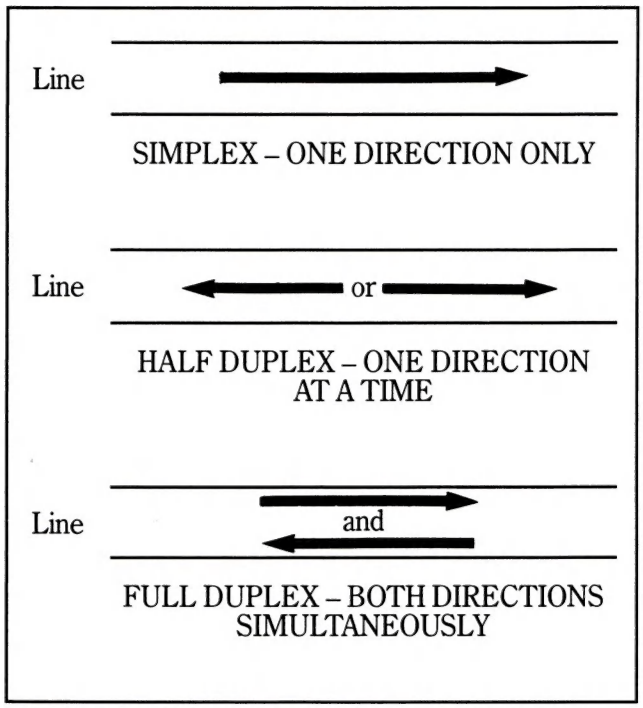


FIGURE 8 – MODES OF OPERATION

It thus becomes possible to operate data terminal equipment in the half duplex mode, using full duplex communication facilities.

☐ Full Duplex (Both Way Operation)

The full-duplex mode of operation involves usage of a data link for simultaneous transmission in both directions.

Table 1 Terminology: Half Duplex, Full Duplex, 2-Wire, 4-Wire

	Feature of Telecom's Datel Service Facility	Mode of Operation of Data Terminal Equipment
Half Duplex	Facility provides one transmission path, which may be used in either direction but not in both directions at the same time	DTEs not capable of simultaneous sending and receiving, regardless of communications facility
Full Duplex	Facility provides two independent transmission paths, one in each direction	DTEs capable of simultaneous sending and receiving
2-Wire	Normally provides half duplex facility, except for certain modems (300 to 2400 bit/s) which can provide a full duplex facility on a 2-wire circuit	Not applicable
4-Wire	Normally provides full duplex facility, but may also be used for half duplex transmission	Not applicable

Transmission Modes for Modem Operation

There are three main transmission modes for modem operation:

- Asynchronous
- Start-Stop
- Synchronous

Asynchronous Transmission

A type of data transmission where each character is preceded by a start signal and followed by a stop signal. The interval between each character may vary. Asynchronous modems allow data transmission at any speed up to and including the nominal speed, e.g. up to and including 300 bit/s.

Start-Stop Transmission

This type of transmission is similar to Asynchronous, where each character is preceded by a start signal and followed by a stop signal. However, modems operating in the start-stop mode will only accept characters at the nominal speed(s), within a small tolerance, e.g. 2400 bit/s, 1200 bit/s or 600 bit/s.
This type of start-stop operation conforms to CCITT Recommendations V.22 and V.22 bis, and interworking with asynchronous or synchronous modems operating under other recommendations is not possible.

Synchronous Transmission

In this type of transmission process, synchronisation is maintained (i.e. the receiver is kept continuously in step with the transmitter) throughout the transmission by electronic clocking devices.

6. NETWORK CONFIGURATIONS

There are three basic configurations for lines in Datacom use. These are:

- Point-to-Point
- Multipoint (Analogue and Digital Splitting)
- Multistream

Point-to-Point

In this configuration, a direct connection is established between two terminals by means of the switched telephone network or a leased line.

As shown in Fig. 9 there can be many individual lines connecting a single location to other locations, but each terminal location has its own link i.e. each line is independent of the others. For any given speed of operation, this network allows maximum throughput of data since all outstations can transmit simultaneously.

With the Switched Network configuration, the PSTN establishes a point-to-point connection that is maintained only for the duration of a single call. With leased lines, connection is instantaneous and the customer has unlimited access to the line.

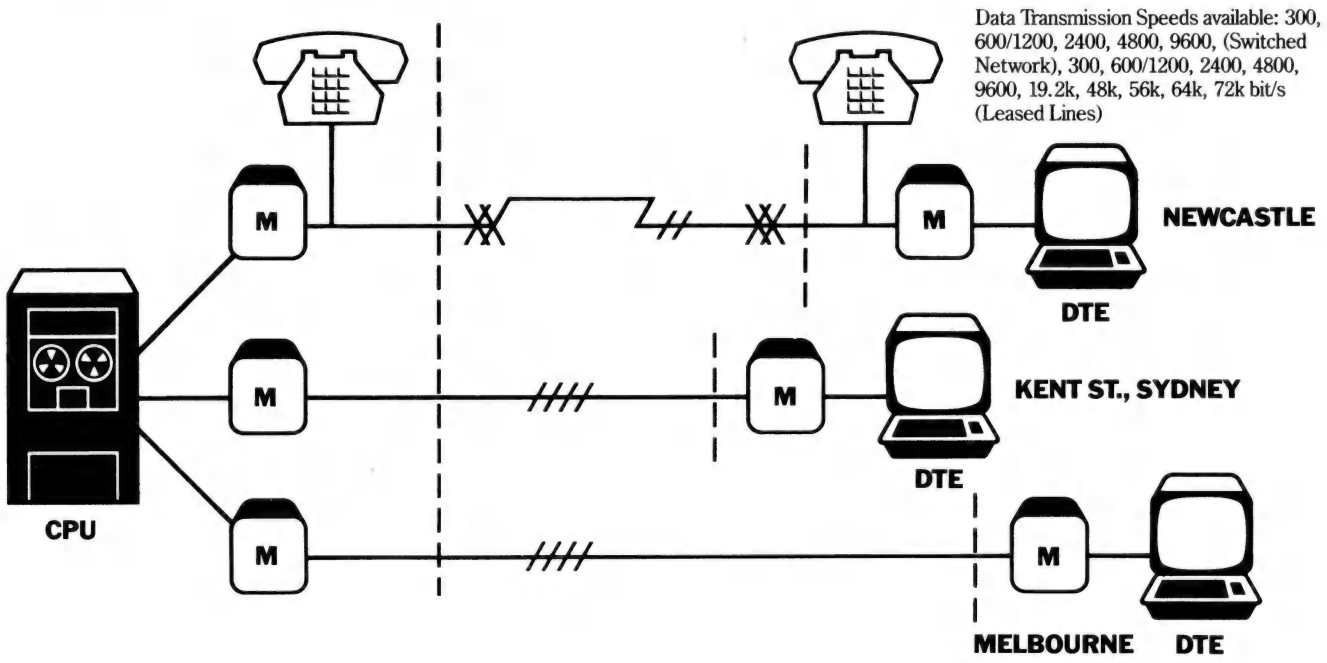


FIGURE 9 — POINT-TO-POINT CONFIGURATIONS ON THE SWITCHED NETWORK AND ON PRIVATELY LEASED LINES

Multipoint – Analogue

This is a configuration in which a connection is established between more than two terminal installations on leased lines. It is used with 4-wire private circuits and its main merit is its economy. It uses a Telecom network device called an analogue splitter/combiner.

The splitter/combiner allows the main drive line component to be split at a telephone exchange into several other lines. With the multipoint configuration, the instation transmits the same message simultaneously to a number of outstations. Transmission of messages from the outstations is under the control of the instation software which sends a polling (interrogating) signal to each outstation in turn, to initiate transmission from that particular outstation. Since simultaneous transmission by the outstations is not possible, multipoint networks are not able to handle traffic densities as high as those handled by point-to-point networks for the same speed of transmission.

Figure 10 shows a Multipoint Private Line Datel Service using analogue splitter/combiners (AS/C). In this example, which is a typical airline reservation system, booking clerks using data terminal equipment (e.g. visual display units or teleprinter machines) at airport and city reservation offices have shared access to the central processing unit, where information concerning seating accommodation on particular flights is continually updated as reservations are made or cancelled.

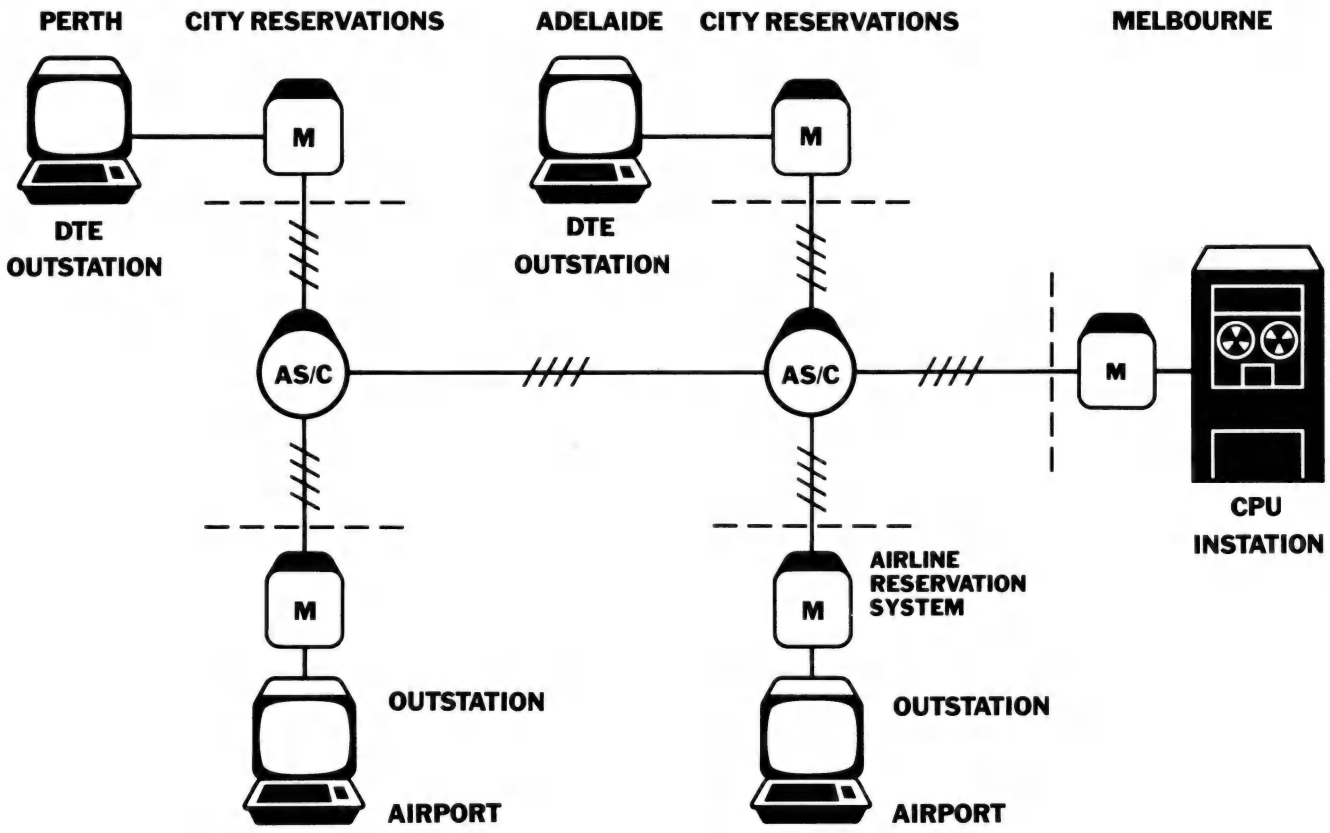


FIGURE 10 – TYPICAL ANALOGUE MULTIPOINT PRIVATE LINE DATEL SERVICE

Multipoint – Digital

Telecom utilises digital splitter/combiners in providing some 9600 bit/s leased line multipoint networks. The operation of these networks is similar to those utilising analogue splitter/combiners, except that the splitting is achieved at the digital interface instead of at the telephone line.

Unlike analogue splitter/combiners, digital splitter/combiners are installed at the customers' premises.

The MJU (Multiple Junction Unit) or digital splitter enables the replication of a digital signal for a number of junctions which may be connected to:

a. data terminal equipment (there is no need for a modem in this instance as the signal is already digital)
b. modems (if further transmission is required over analogue circuits)
c. MJUs (to allow for further splitting)
d. other sources of digital signals, such as computers, multiplexors, etc.

The major applications of the MJU are:

- use as a modem-sharing device as per Figure 11
- use in connecting point-to-point 9600 bit/s services into a multipoint network as shown in Figure 12
- use as a digital splitter in conjunction with a multistream (as shown in Figure 14) or other service

Normally, Telecom will decide which type of splitter/combiner will be provided for multipoint networks at the other data transmission speeds. If preferred, privately supplied digital splitter/combiners may be used. These will require authorisations to connect to the Telecom network.

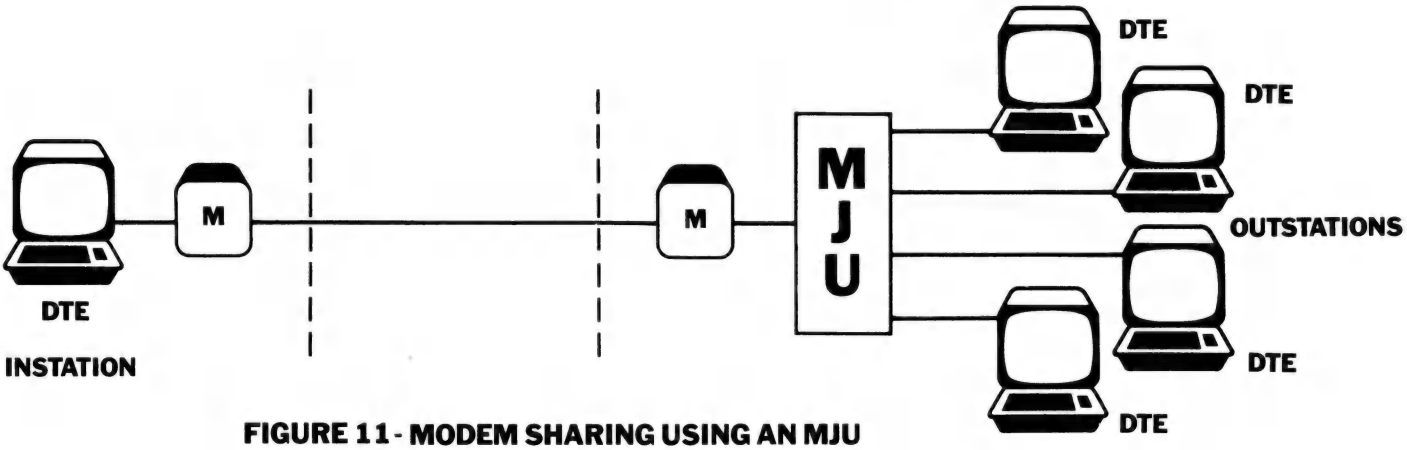


FIGURE 11 - MODEM SHARING USING AN MJU

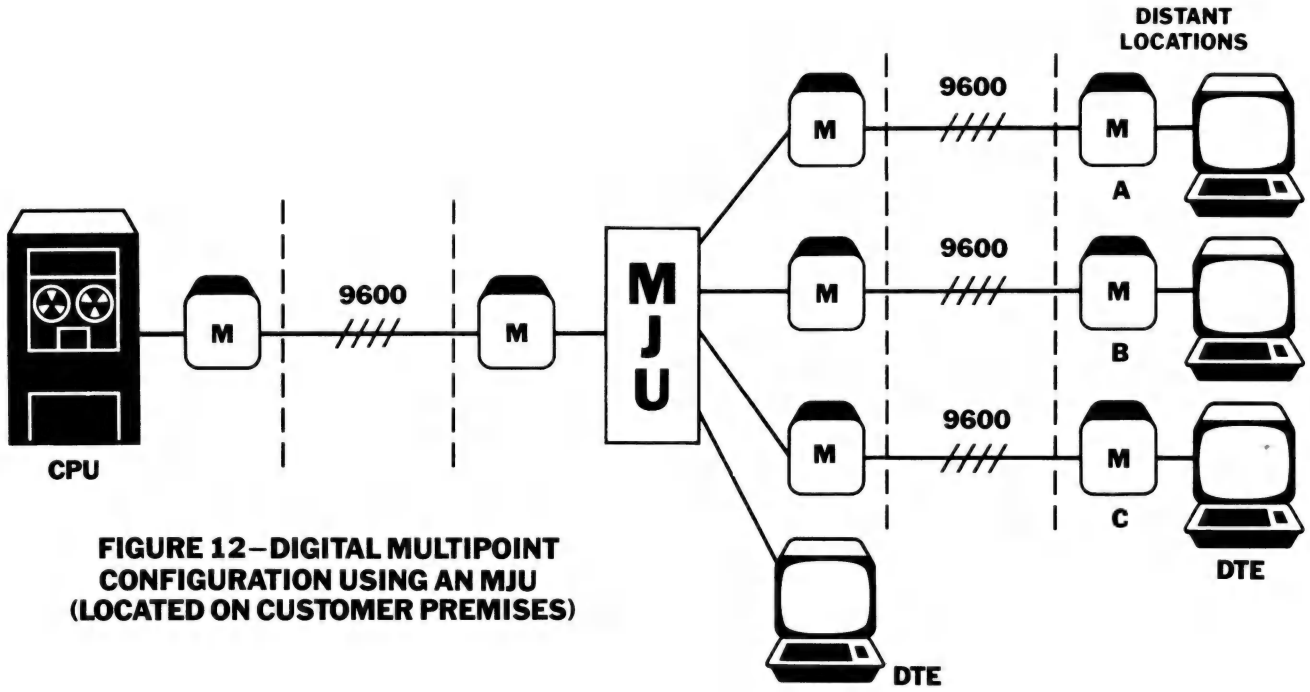


FIGURE 12 – DIGITAL MULTIPOINT CONFIGURATION USING AN MJU (LOCATED ON CUSTOMER PREMISES)

Multistream

The modem used in the 9600 bit/s Long Distance Service is capable of accepting a number of lower-speed data streams, which it multiplexes into a single 9600 bit/s stream for transmission over a dedicated line. The modem can also receive a 9600 bit/s data stream and demultiplex it into an identical set of lower-speed data streams. This procedure is known as multistreaming.

Multistreaming provides a cost saving to a customer who has a number of terminals in one location which communicate with terminals in another location. Instead of a number of point-to-point dedicated lines being provided, the multistream modem operates over a single point-to-point line.

The options available to customers are:

a. One stream of 9600 bit/s
b. Two streams of 4800 bit/s each
c. Two streams, one of 7200 bit/s, the other of 2400 bit/s
d. Three streams, one of 4800 bit/s and two each of 2400 bit/s
e. Four streams of 2400 bit/s.

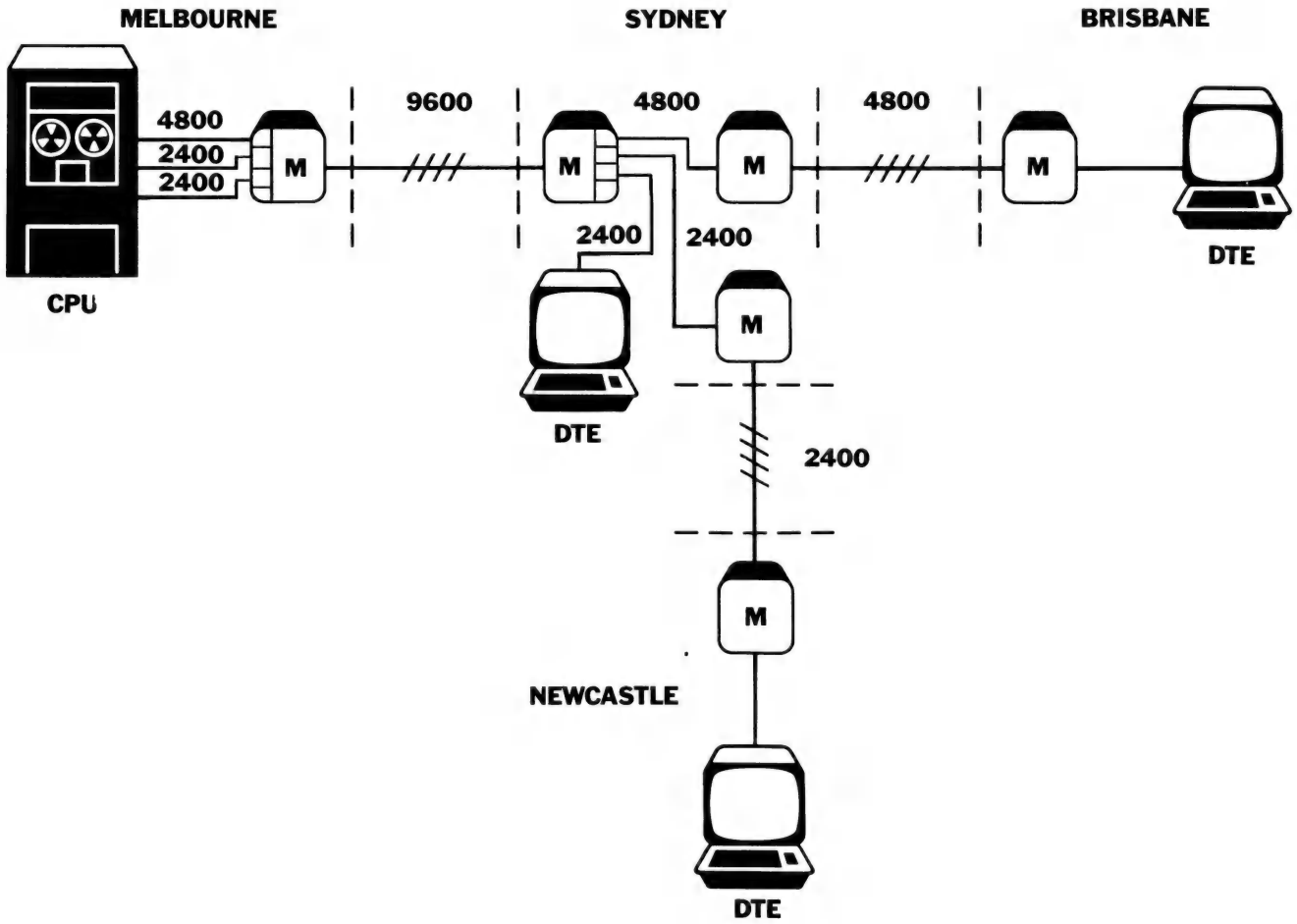


FIGURE 13 – MULTISTREAM – 9600 BIT/S SERVICE

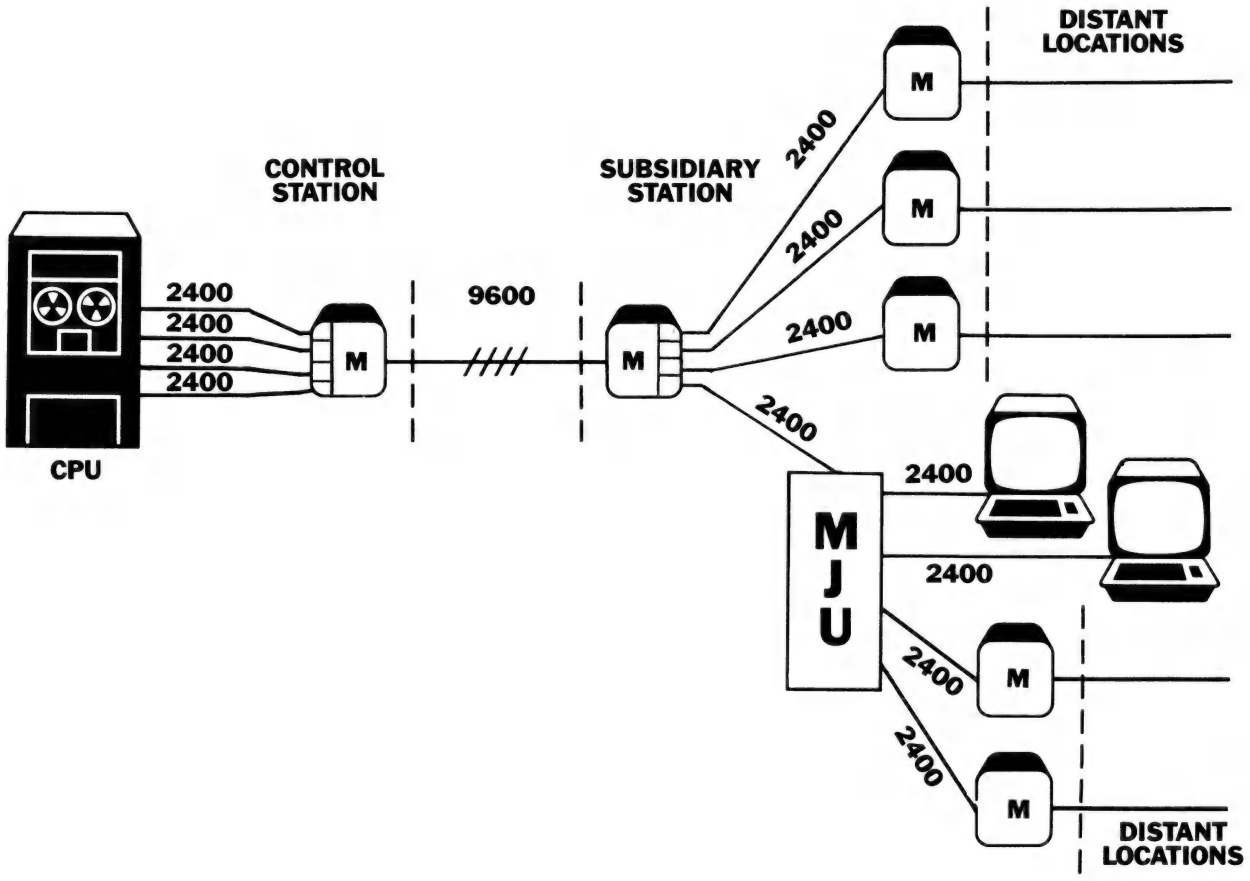


FIGURE 14 — MULTISTREAM CONGIFURATION USING AN MJU AS A DIGITAL SPLITTER

7. TELECOM'S DATEL PRODUCT RANGE

Telecom Australia's Datel Services are classified according to transmission type (i.e. Switched Network or Private Line), the speed of operation (in bit/s) and the manner in which they will be configured (i.e. point-to-point or multipoint).

For the Datel Product range Telecom provides an end-to-end service i.e. Telecom provides and maintains both the line and the modems (a maintenance component is included in the rental charges).

Should you ever encounter problems with your Datel Service, Telecom technical staff are available to assist you, anywhere in Australia.

Table 2 Switched Network Datel Service Range:

Speed (Bit/s)	Based on CCITT Recommendation	Mode of Operation	Transmission Type HD/FD	Automatic/ Manual Answer	Reduced Rate Capability	Phone Standard/ Datel	Comments
300	V.21	Asynch.	HD / FD	Auto / Man.		Stan. / Datel	
600/1200	V.23	Asynch. / Synch.	HD	Auto / Man.	600	Stan. / Datel	75 bit/s backward channel can be provided
1200	V.22	Start-Stop / Synch.	FD	Auto / Man.	600 / 300	Stan. / Datel	
2400	V.26 bis	Synch.	HD	Auto / Man.	1200	Stan. / Datel	Also requires an SNA for manual answer or an HDAAA for auto-answer
2400	V.22 bis	Start-Stop / Synch.	FD	Auto / Man.	1200	Stan.	Two-wire FD service with integral auto-dialler
4800	V.27 ter	Synch.	HD	Auto / Man.	2400	Stan. / Datel	Also requires the use of an SNA for manual answer or an HDAAA for auto-answer
4800	V.27 ter	Synch.	FD*	Man.	2400	Stan.	*FD is facilitated by the use of 2 exchange lines and an SNA at each end
9600	V.29	Synch.	FD*	Man.	7200 4800 2400	Stan.	*Ditto

Asynch. – Asynchronous
Synch. – Synchronous
HD – Half Duplex
FD – Full Duplex
Auto – Automatic Answer
Man. – Manual Answer
Stan. – Standard Telephone
Datel – Datelphone
SNA – Switched Network Adaptor
HDAAA – HD Auto Answer Adaptor

SWITCHED NETWORK DATEL SERVICES

Operating through the Public Switched Telephone Network (PSTN), these services are also known as Data Exchange Line (DXL) services. (Note: The modem interface on all Switched Network Datel Services conforms with CCITT Recommendation V.24 and V.28.) DXL services operate via exchange line access (either one or two lines depending on service required) to the PSTN and thus require a telephone for each exchange line to effect this. Unless otherwise stated the possible configurations are:

- a standard telephone
- a standard telephone with a Datelplinth; or
- a Datelphone

There are some non-standard telephones which are used on voice services (special facility and small business system telephones) which are not technically satisfactory for a DXL service. Please contact your Telecom State Data Office for any queries regarding compatibility.

NEW DATEL SERVICE

A new Datel Modem "4-in-1" will be made available for sale and rental from the second half of 1987.

It is intended primarily for use as a full-duplex modem over the Public Switched Network. Operation on Datel Leased Lines is also possible.

The unit is capable of operating at 2400 bits and 1200 bits per second in either asynchronous or synchronous mode and also 0-300 bits and 1200/75 bits per second in asynchronous mode, making it ideal for PC users who demand easy access to Database and Bulletin Boards such as Viatel, Telememo, Teletex etc.

This high performance and fully automatic modem complies with CCITT Recommendations V22bis, V22, V21, V23, and Bell Standards 212A, 202S and 103.

300Bit/s Service

The main characteristics of this service are as follows:

- The modem is based on CCITT Recommendation V.21
- Transmission of data is asynchronous at speeds up to and including 300 bit/s
- Full duplex operation allows data to be transmitted in both directions simultaneously
- Half duplex operation is also possible
- Automatic or manual answer options are available

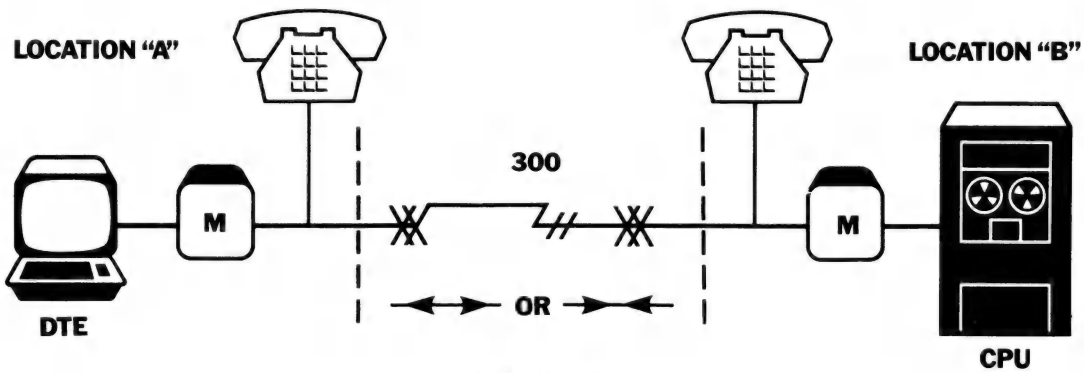


FIGURE 15

600/1200 Bit/s Half Duplex Service

- The modem is based on CCITT V.23 Recommendations
- This facility provides a "half duplex" capability in which transmission and reception of data at 600/1200 bit/s is possible in each direction but not simultaneously
- Manual or automatic answer options are available
- An optional 75 bit/s backward channel can be provided
- Transmission of data may either be asynchronous or synchronous

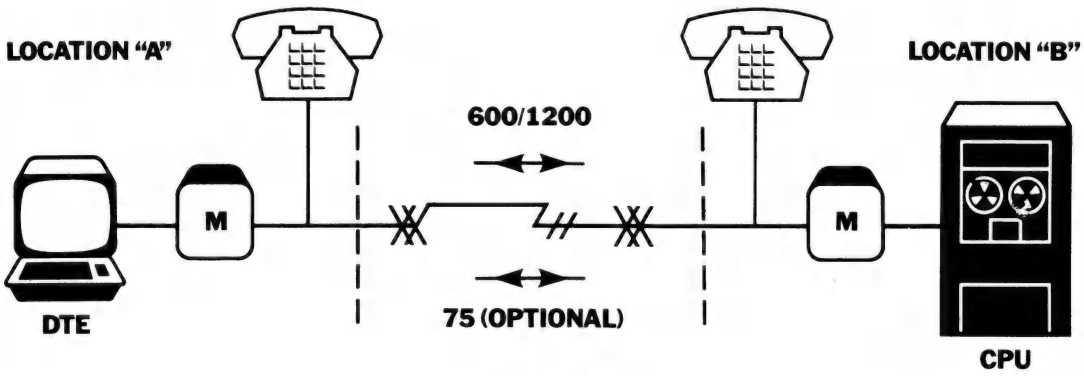


FIGURE 16

1200 Bit/s Full Duplex Service

- The modem is based on CCITT Recommendation V.22
- This service allows full duplex transmission at 600 and 1200 bit/s over 2 wires
- Possible modes of transmission are:
  - □ synchronous at 600 or 1200 bit/s
  - □ start-stop at 600 or 1200 bit/s
  - □ start-stop at 1200 bit/s with asynchronous at up to 300 bit/s

Note that in this case, 'start-stop' operation is not equivalent to 'asynchronous' and that this modem is not compatible with the 300 bit/s (V.21) or 600/1200 bit/s (V.23) modems

- Both manual and automatic answer options are available.

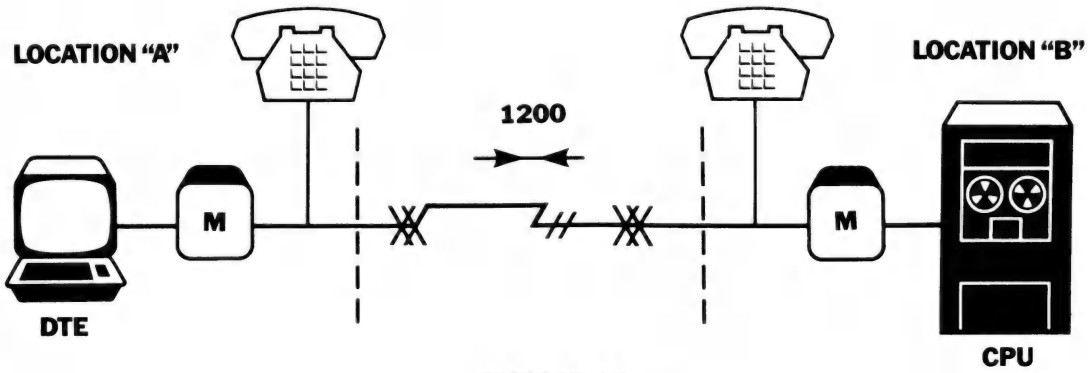


FIGURE 17

2400 Bit/s Half Duplex Service

- This service is provided using:
  - □ a 2400 bit/s modem based on CCITT Recommendation V.26 bis
  - □ a Switched Network Adaptor (SNA)

  Or
  - □ a Half Duplex Auto Answer Adaptor (HDAAA) if auto answer is required
- The transmission of data is synchronous
- The modem has the capability of operating at the reduced rate of 1200 bit/s. In this mode, it is not compatible with the 600/1200 Half Duplex Service based on CCITT Recommendation V.23

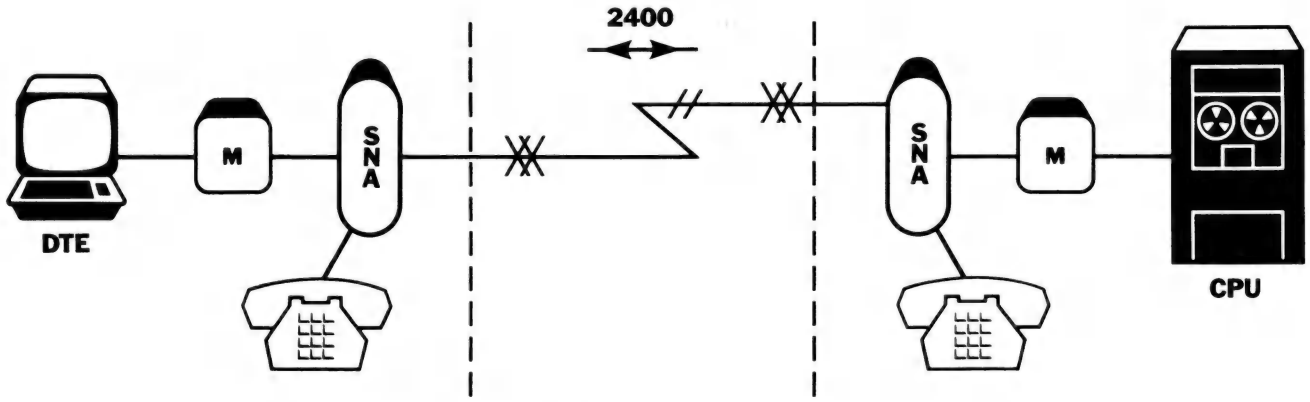


FIGURE 18

2400 Bit/s Full Duplex Service

- The 2400 bit/s modem is based on CCITT Recommendation V.22 bis
- Full Duplex transmission over 2 wires may be synchronous or start-stop
- Integrated auto-dialling facility
- Manual calling option
- Automatic or manual answering
- The modem has the capability of operating at the reduced rate of 1200 bit/s. In this mode it is compatible with the 1200 bit/s Full Duplex Service based in CCITT Recommendation V.22.

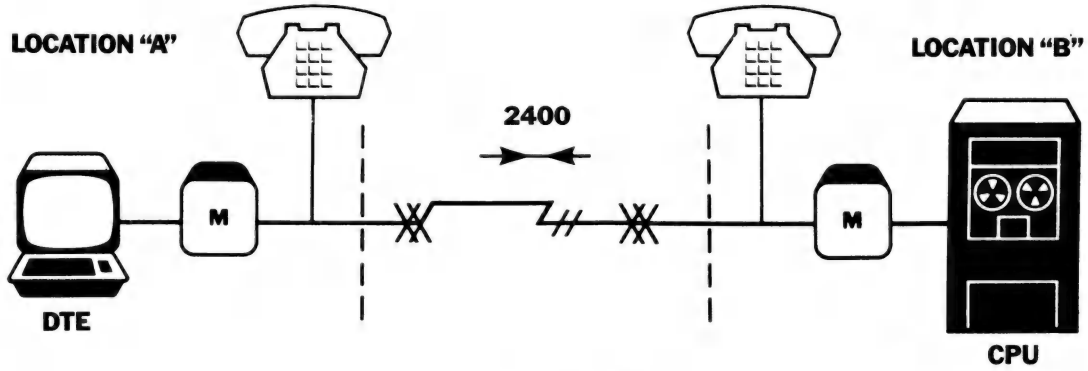


FIGURE 19

4800 Bit/s Half Duplex Service

- This service is provided using:
  - ☐ a 4800 bit/s modem based on CCITT Recommendation V.27 ter
  - ☐ a Switched Network Adaptor (SNA) for manual answer
    Or
  - ☐ a Half Duplex Auto Answer Adaptor (HDAAA) if auto answer is required
- Transmission of data is synchronous
- The modem has the capability of operating at the reduced rate of 2400 bit/s. In this mode, it is not compatible with the 2400 bit/s Half Duplex Service based on CCITT Recommendation V.26 bis

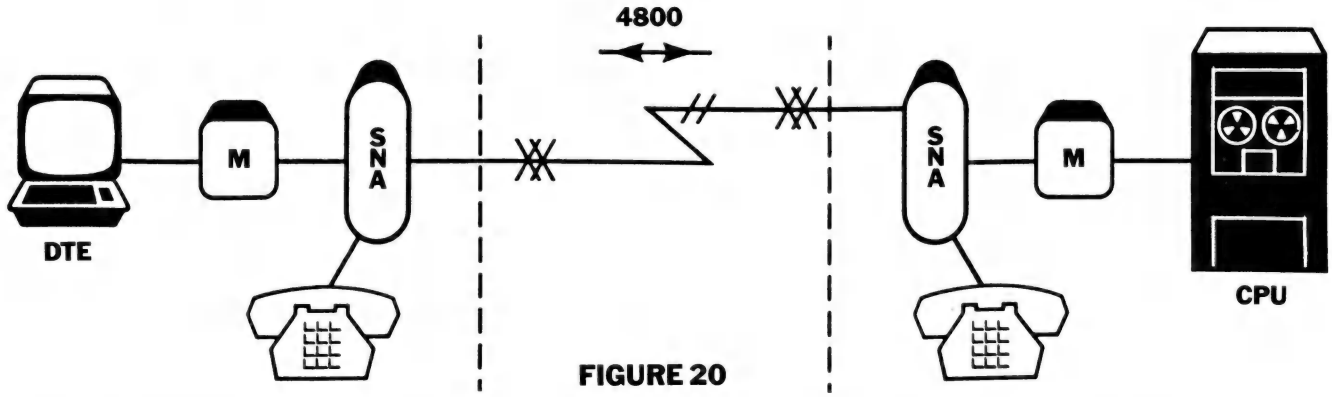


FIGURE 20

4800 Bit/s Full Duplex Service

- This service provides full duplex operation using modems that are based on CCITT Recommendation V.27 ter
- Half Duplex operation is also possible
- In addition to the modem, this service is provided using two exchange line services with two standard telephones and a Switched Network Adaptor
- Transmission of data is synchronous
- Only manual answer is possible
- The modem has the capability of operating at the reduced rate of 2400 bit/s
  In this mode, it is not compatible with the 2400 bit/s Full Duplex Service based on CCITT Recommendations V.26 bis

9600 Bit/s Full Duplex Service

- The modem is based on CCITT Recommendation V.29, permitting synchronous transmission of data at 9600 bit/s
- Full duplex operation also allows data to be transmitted in both directions simultaneously
- In addition to the modem, this service is provided using two exchange line services, a Switched Network Adaptor and two standard telephones
- Only manual answer is possible
- The modem has the capability of operating at the reduced rates of 7200, 4800 and 2400 bit/s. In this mode, it is not compatible with the 4800 bit/s Full Duplex Service based on CCITT Recommendation V.27 ter

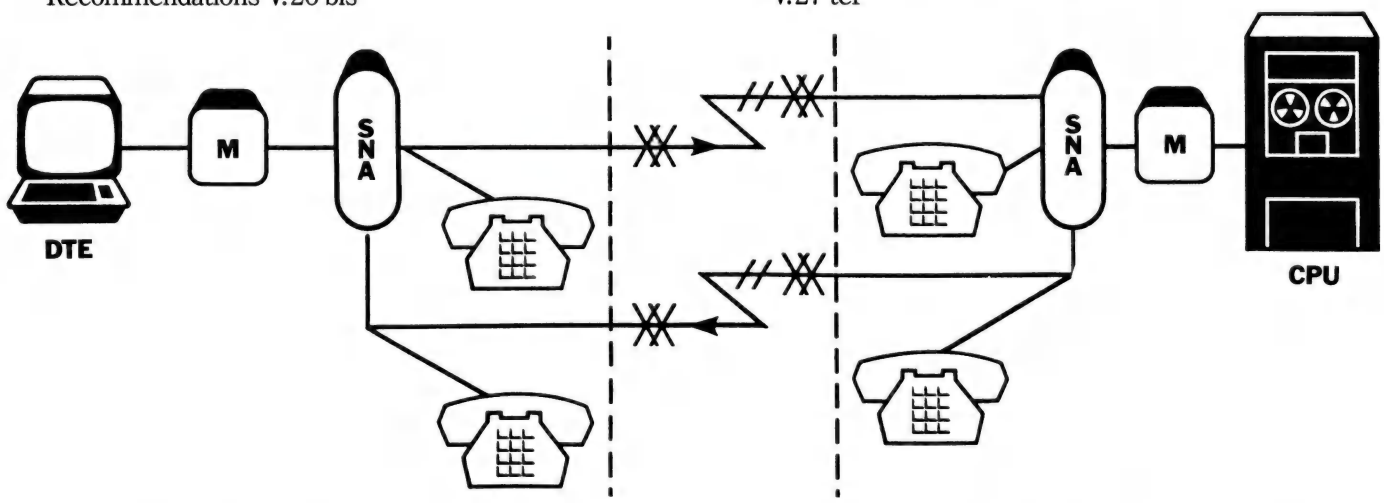


FIGURE 21—4800 AND 9600 BIT/S FULL DUPLEX SERVICES (DUAL DIAL SERVICE)

PRIVATE LINE DATEL SERVICES

Operating on an exclusive end-to-end connection, these services are also known as Data Private Line (DPL) services.

The modem interface on the 300 to 9600 bit/s Private Line Datel Services conforms to CCITT Recommendations V.24 and V.28.

Table 3 Private Line Datel Service Range:

Service	Speed (Bit/s)	Based on CCITT Recommendation	Mode of Operation Asynch./ Synch.	Transmission Type HD/FD	Line Type 2W/4W	Configuration P/M	Fallback+ Service Capability	Comments
Low Speed Service (LSS)	300	V.21	Asynch.	HD / FD	2W	P	No	
	600/1200	V.23	Asynch. / Synch.	HD / FD	2W / 4W	P / M	Only on FD Services	75 bit/s backward channel can be provided
Local Area Service (LAS)	2400		Asynch. / Synch.	HD / FD	4W	P / M	No	
	4800		Asynch. / Synch.	HD / FD	4W	P / M	No	
	9600		Asynch. / Synch.	HD / FD	4W	P / M	No	
	19200		Asynch. / Synch.	HD / FD	4W	P / M	No	Limited to 6.4 km route distance from terminal to terminal
Short Distance Service (SDS)	2400		Synch.	HD / FD	4W	P / M	No	
	4800		Synch.	HD / FD	4W	P / M	No	
	9600		Synch.	HD / FD	4W	P / M*	No	
Long Distance Service (LDS)	2400	V.26	Synch.	HD / FD	4W	P / M	Yes	
	4800	V.27 bis	Synch.	HD / FD	4W	P / M	Yes	
	9600	V.29	Synch.	HD / FD	4W	P / M*	Yes	Also features multistream configurations
High Speed Service (HSS)	48000	V.35 V.35-36	Synch.	FD	4W	P	No	
	56000	V.35-36	Synch.	FD	4W	P	No	
	64000	V.35-36	Synch.	FD	4W	P	No	
	72000	V.35-36	Synch.	FD	4W	P	No	

2W – 2 Wires
4W – 4 Wires
P – Point-to Point
M – Multipoint
HD – Half Duplex
FD – Full Duplex
+Point-to-Point services only
*A multiple point-to-point network available with the addition of a Multiple Junction Unit

Notes

The Datel Private Line service has been restructured into five market segments on a speed and distance basis:
(i) LSS – 300 to 1200 bit/s operation over any distance
(ii) LAS – 2400 bit/s to 19.2 Kbit/s within the same telephone exchange area
(iii) SDS – 2400 to 9600 bit/s operation over a radial distance not exceeding 10km between serving exchanges
(iv) LDS – 2400 to 9600 bit/s operation over any distance exceeding 10km
(v) HSS – 48 Kbit/s to 72 Kbit/s operation over any distance (short-haul does not exceed 7km inter-exchange radial distance).

Low Speed Service (LSS)

This service offers operation at 300 to 1200 bit/s, over any distance.

☐The 300 Bit/s Service

The main characteristics of the service are as follows:

- The modem is based on CCITT Recommendation V.21
- Transmission of data over 2-wire leased lines is asynchronous
- This service is designed for full duplex operation to allow data to be transmitted simultaneously in both directions
- Half duplex operation is also possible
- Network configuration is point-to-point

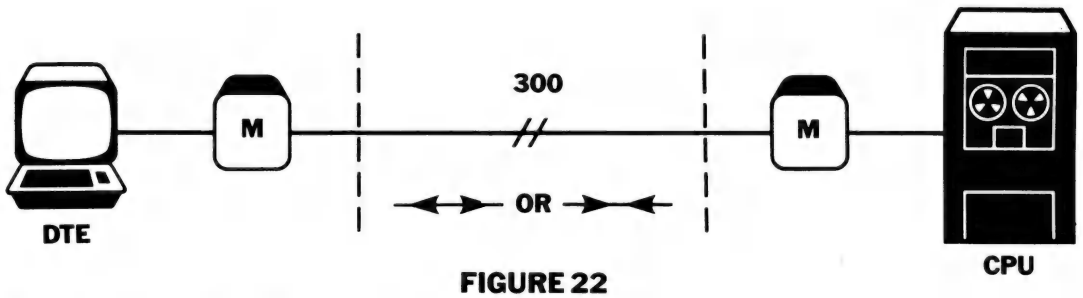


FIGURE 22

☐600/1200 Bit/s Half Duplex Service

- The modem is based on CCITT Recommendation V.23
- Transmission of data over 2-wire leased lines may either be asynchronous or synchronous
- This facility provides a half duplex capability in which transmission and reception of data is possible in both directions alternately
- Network configuration may be point-to-point or multipoint
- An optional 75 bit/s backward channel can be provided

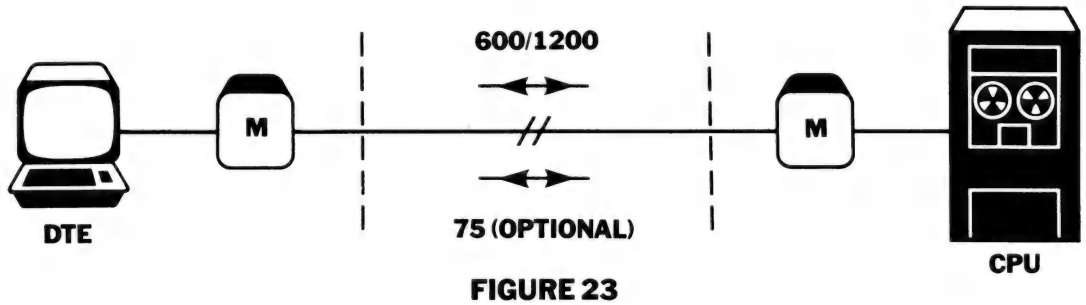


FIGURE 23

☐600/1200 Bit/s Full Duplex Service

- The modem is based on CCITT Recommendation V.23
- Transmission of data over 4-wire leased lines may be asynchronous or synchronous
- Network configuration may be point-to-point or multipoint
- Switched network dual dial fallback service is available (see Figure 29)

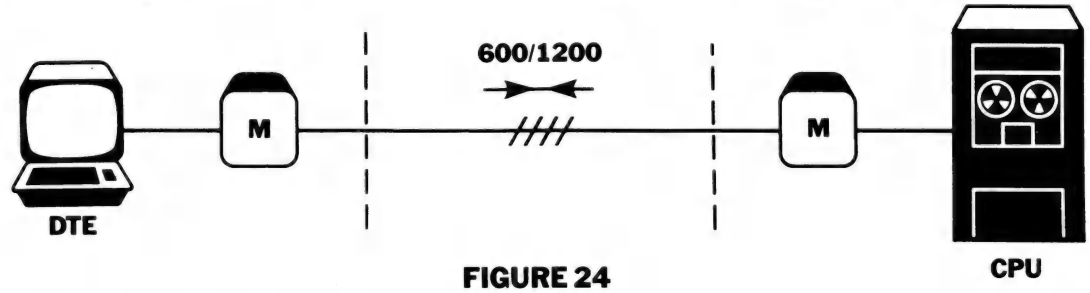


FIGURE 24

Local Area Service (LAS)

The Local Area Service was specifically developed to cater for computer communications between locations within the same telephone exchange area. The service utilises baseband modems to provide a range of services at speeds of **2400, 4800, 9600** and **19,200 bit/s.**

All LAS services may be configured as point-to-point or multipoint, with multipoint services having all outstations in the same exchange area as the control station, as shown in Figure 25.

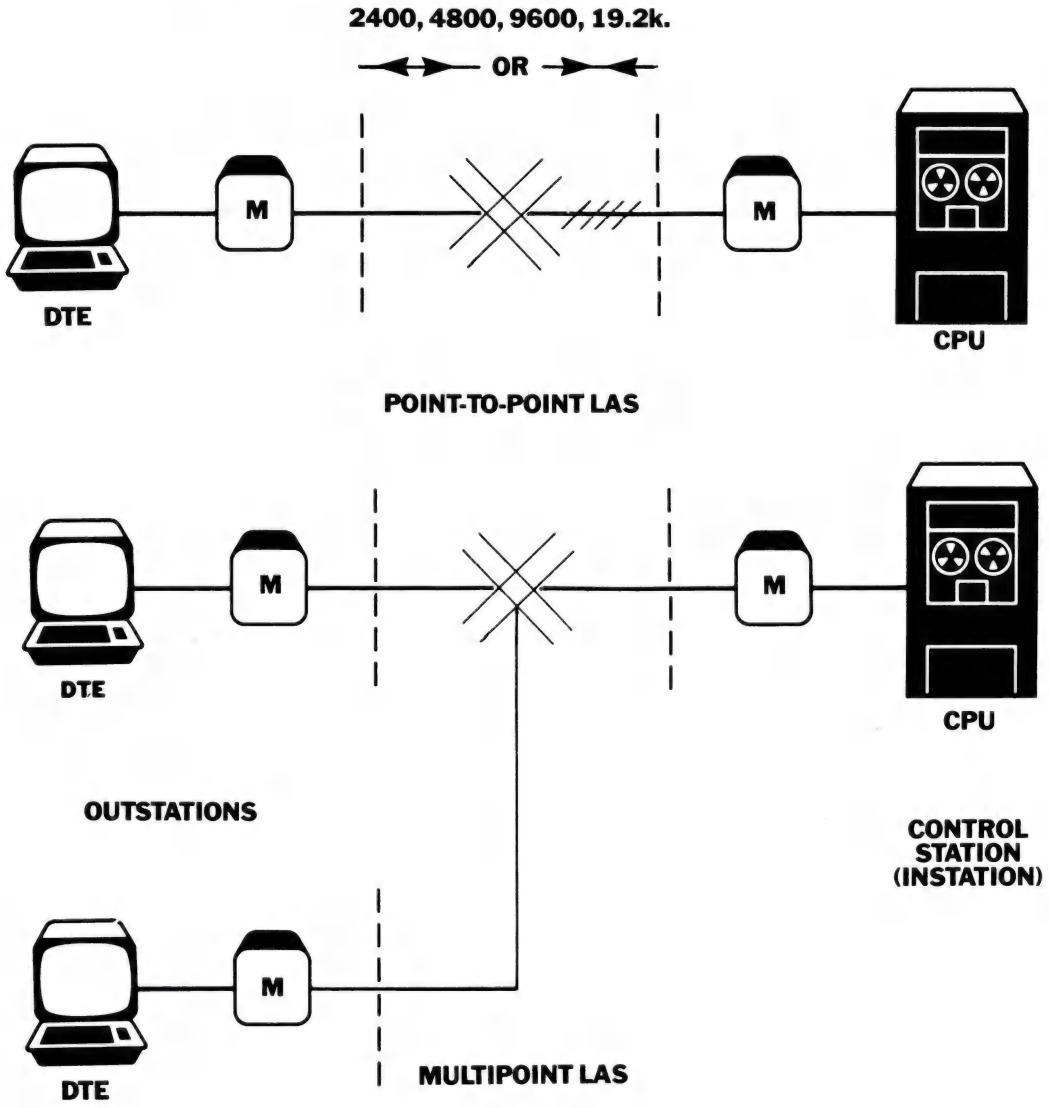


FIGURE 25 - LAS SERVICE TYPES

LAS services are designed for full duplex operation, but half duplex operation is also possible. Other features of LAS are:

- Synchronous or asynchronous transmission
- Point-to-point or multipoint network configuration
- Digital interface, local loop and remote loop test facilities are standard on point-to-point services

NOTE that the 19,200 bit/s service is limited to a route distance of 6.4km from terminal to terminal.

Short Distance Service (SDS)

This service is available to customers whose computer facilities are connected to terminal exchanges which are a radial distance of 10 km or less apart. For multipoint services, this limit applies between the control station and any outstation, and if it is exceeded by any leg of the network, the service will be charged as a Long Distance Service.

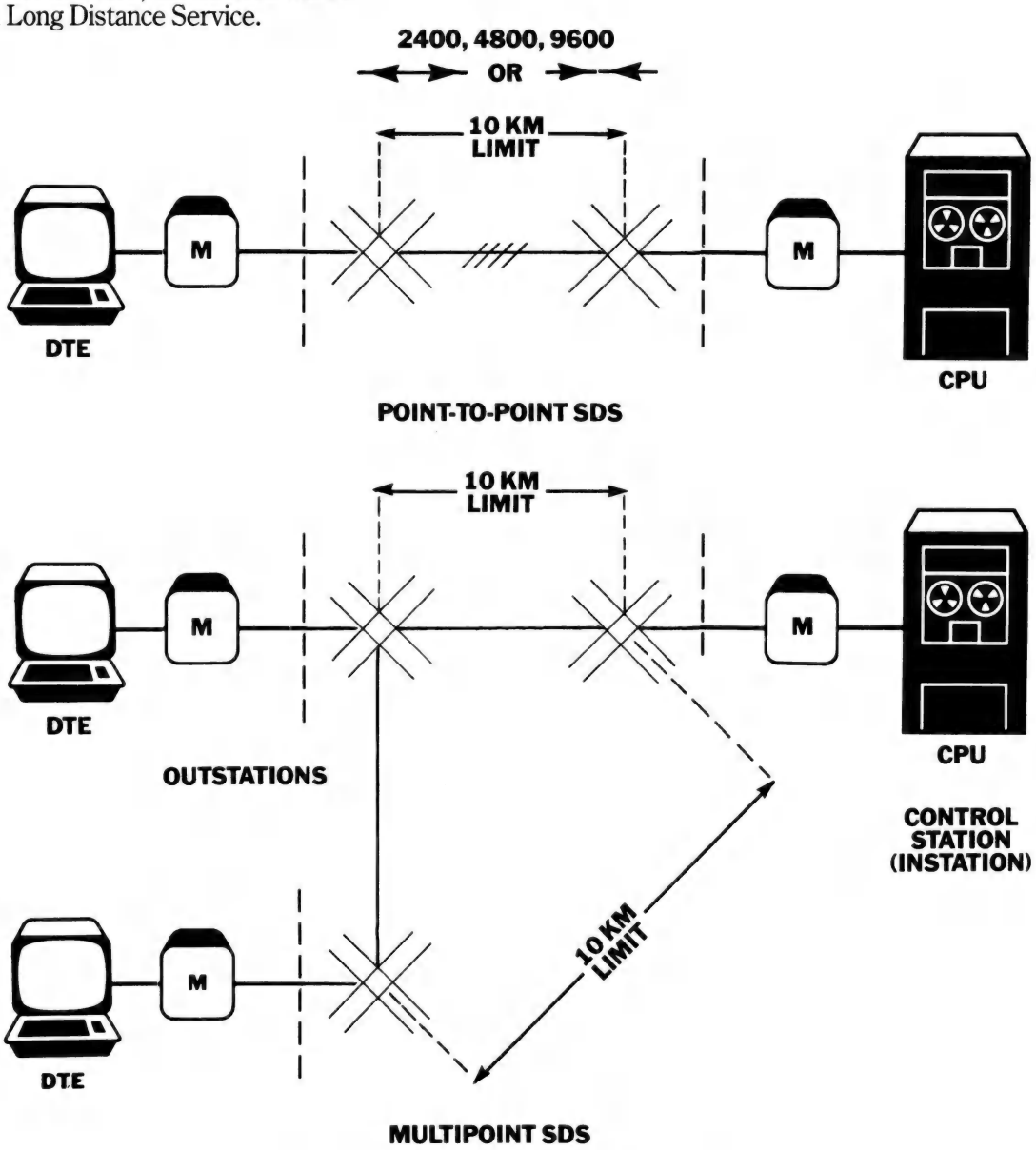


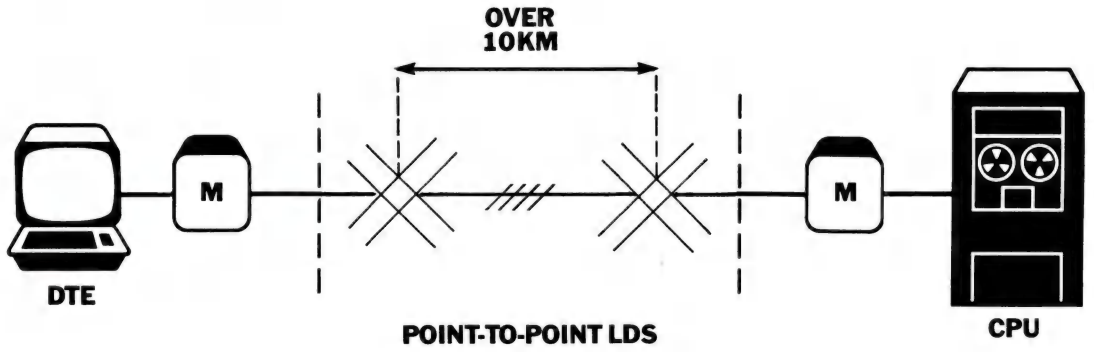
FIGURE 26 – SDS SERVICE TYPES

The SDS offers speeds of **2400, 4800** and **9600** bit/s. The service is designed for full duplex operation, but half duplex operation is also possible. Additional features of the service are:

- Point-to-Point or multipoint configuration at all speeds. 9600 bit/s multipoint services are provided using digital splitting (see Figures 11 and 12).
- Synchronous transmission only
- Digital interface, local loop and remote loop test facilities are standard on point-to-point services.

Long Distance Service (LDS)

The Long Distance Service caters for customers whose computer facilities are connected to terminal exchanges more than 10km apart, and offers services at **2400, 4800** and **9600** bit/s.



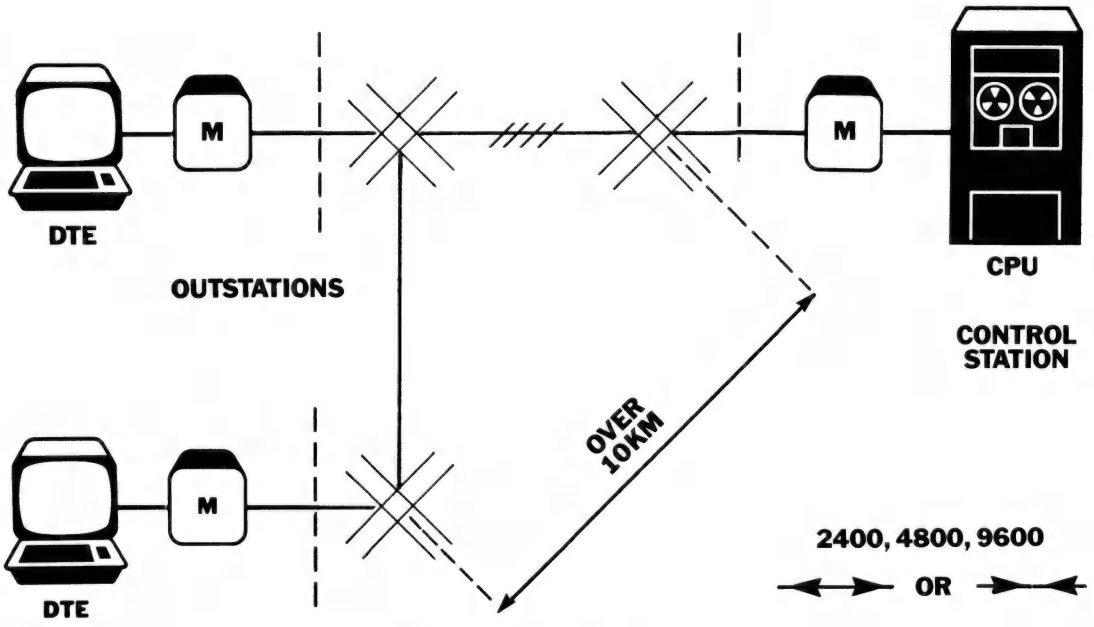


FIGURE 27 – LDS SERVICE TYPES

LDS services have the same features as those listed under SDS, but services are provided using "long haul" modems which comply with CCITT Recommendations as follows:

- 2400 bit/s – CCITT Recommendations V.26 & V.26 bis
- 4800 bit/s – CCITT Recommendations V.27 bis & V.27 ter
- 9600 bit/s – CCITT Recommendation V.29

In addition, the LDS offers the following facilities:

- A Fallback Full Duplex Service on the switched network is available at all speeds (see Figure 29).
- Multistream is available on the 9600 bit/s service only (see page 12). The options available with this facility are:
  - ☐ One stream of 9600 bit/s
  - ☐ Two streams of 4800 bit/s each
  - ☐ Two streams, one of 7200 bit/s, the other of 2400 bit/s
  - ☐ Three streams, one of 4800 bit/s and two each of 2400 bit/s
  - ☐ Four streams of 2400 bit/s.

A special feature of the service is a display on the modem showing the speed on each port.

High Speed Service (HSS)

The High Speed Service offers wideband services at **48,000, 56,000, 64,000** and **72,000** bit/s.

- The service utilises baseband modems based on CCITT Recommendations V35 and V36.
- "Short Haul" modems are used for services where the distance between serving exchanges does not exceed 7km.
- "Long Haul" modems are used where the distance between serving exchanges exceeds 7km.
- Baseband repeaters are provided at exchanges where it is necessary to regenerate the high speed data signals.
- Short Haul and Long Haul services offer:
  - □ full duplex operation
  - □ synchronous transmission
  - □ point to point configuration only.
- Local and remote loop testing facilities are provided on Short Haul services.

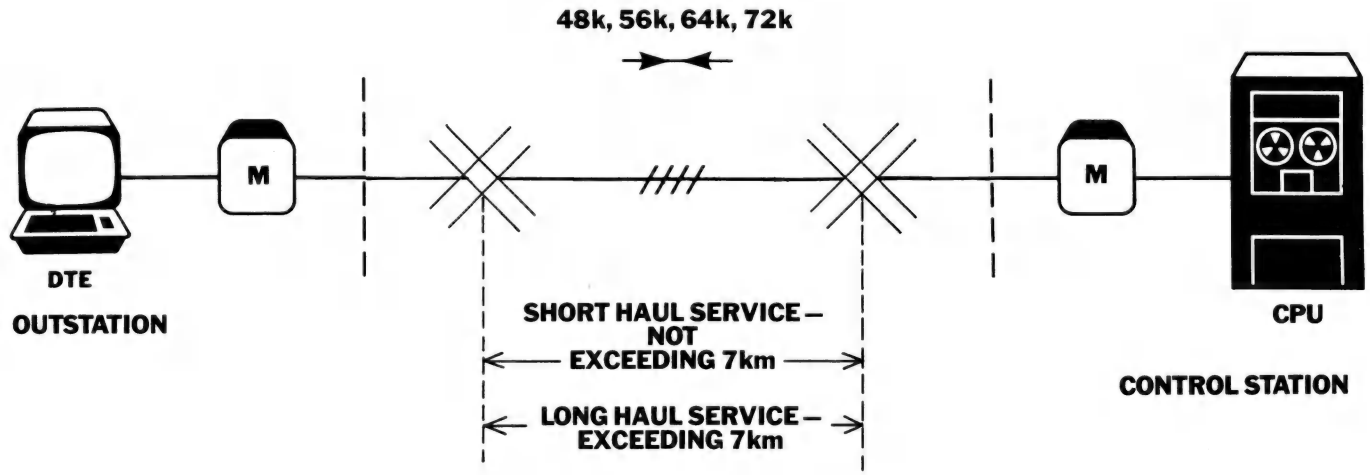


FIGURE 28 –HSS SERVICE TYPES

8. ADDITIONAL FACILITIES

Alternate Voice/Data Facility

The alternate voice/data facility gives greater cost-effectiveness to communication links between company sites, by allowing the link to be utilized for either voice or data communications as required.

This facility is provided on 4-wire Datel Private Lines by using a Datel Voice Adaptor. The Adaptor is installed in a standard telephone along with ring and voice/data buttons, and works by enabling a DPL to be used for connection to voice transmission equipment when not required for data transmission (DXL services may be used for transmitting voice or data in all cases.)

The two basic types of AVD facility are:

- Order wire facility where special telephone instruments at either end of the DPL can be used to establish a point-to-point link.
- Tie line facility which enables the DPL to be used as a tie line between Customer Switching Systems.

Fallback Full Duplex Service

Some users of Datel private lines require backup facilities to enable data to be transmitted by alternate means in the event of a failure on their private line.

A Fallback service is offered by Telecom which allows a customer to establish an equivalent 4-wire connection by means of two switched telephone network connections. This service involves the provision of a special interface device, known as a Switched Network Adaptor, and two telephone exchange line services at each location where fallback is required.

The Fallback facility is available for use in conjunction with the 1200 bit/s Full Duplex and 2400, 4800 and 9600 bit/s Long Distance Private Line services and is available in manual answer only.

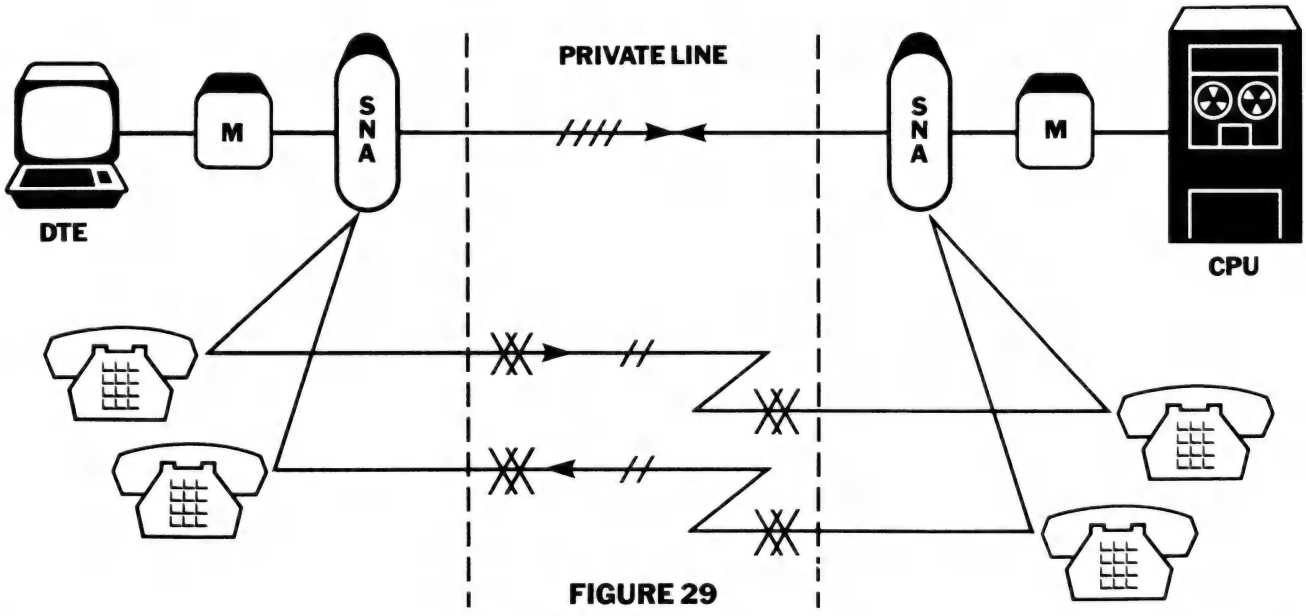


FIGURE 29

Interconnection between Switched and Leased Networks

Many customers, particularly those using timesharing computers, may wish to access computers in other cities for special data processing services. In general, the cost of STD calls can make the use of these services fairly expensive.

To overcome this problem and provide these customers with the service they want, it is possible to provide a leased line between the cities concerned which in turn may be interconnected with the switched telephone network, thereby allowing local call access to the distant computer. Telecom's data advisers should be contacted for further information regarding this service.

Modem Cabinets

Where there are 3 or more Datel modems at any one location, there is a requirement for these to be housed in a modem cabinet to facilitate maintenance. Modem cabinets may be purchased from private suppliers or from Telecom. Privately supplied modem cabinets must be authorised by Telecom as having met stringent electrical safety standards set by the relevant state electrical authorities, before Telecom modems may be installed in them. Descriptions and technical requirements of the various modem cabinets are available from your State Data Office.

High Density Installations

High density modems are housed in special racking equipment which accommodates single card modems. These high density cabinets are included in the price of DPL services at 300 and 1200 bit/s. For high density installations on all DPL services above 1200 bit/s, and on all DXL services, price and availability will be advised on application.

Data Through Customer Switching Systems (CSSs)

Customers also have the option of transmitting data through Customer Switching Systems (CSSs) (i.e. manual or automatic telephone switchboards or small business systems) which may be provided by Telecom or private equipment suppliers.

Where a CSS is used in conjunction with Datel Services, i.e. where Telecom modems are used, the facility is known as a DPX Service.

A CSS might be used for data communications both within an office, and between a CSS extension and other locations throughout Australia and overseas. However, there are various facility considerations which must be taken into account in assessing whether the performance characteristics required will be met by any specific CSS. The suppliers of the CSS should be able to provide the necessary facility details regarding data protection on their system.

Facility Considerations

- When purchasing a Customer Switching System where Data communications is also a consideration, ensure that it is capable of handling the data speeds that your computer system requires.
- Some Customer Switching Systems provide a "Data Classification" facility. With such a system, a CSS extension line which has been "data classified" is programmed to inhibit certain CSS features, such as priority, trunk offer and call waiting tone, which could interfere with or mutilate a stream of data.

  Extensions which have been "data classified" may be either permanently or temporarily classified depending on the features of the CSS. When buying a CSS which is capable of data transmission via its extensions, make sure that it offers adequate protection features to prevent data interference or mutilation which may arise from other facilities of the system.
- It may be possible, through a combination of other CSS facilities on a line used for data transmission for the data stream to suffer interference. An example of this could be pulses from your metering facility. While this is unlikely to occur, Telecom can advise you of any alternatives open to you. However it may eventually mean that the facility causing interference will need to be removed, or alternatively, it may be necessary to transfer your data transmission requirements to a separate data service.
- It is possible that CSS ring-tone may not activate the auto-answer facility on a CSS extension modem.

Customer Advice

If you are currently a Telecom CSS customer using Datel or Voice Grade Dedicated Line Facilities, or are considering the purchase of a new CSS, our advisory staff are available to discuss the CSS alternatives best suited to meet your needs in terms of data transmission speeds and data protection.

If you have a Telecom-supplied CSS with no inbuilt data protection facility, and you wish to use it for data communications, our advisers will be pleased to outline the best operational procedures to be adopted to protect your data from possible interference.

Customers with a privately supplied CSS should discuss the issue with their supplier in the first instance.

For further information about any aspect of the Service, contact your local Telecom Business Office, PABX consultant, or the Data Office in your capital City.

9. OTHER DATA COMMUNICATION SERVICES

Telecom Australia offers a wide range of Data Services that are alternative as well as complementary to the Datal Services.

These services incorporate advances in both the computer and telecommunication technologies to give customers the flexibility required to meet their existing and/or developing data communication needs.

This section briefly describes these Data Services.

Network Diagnostic and Control System (NDACS)

NDACS caters for Datel customers who have a critical need for very high end-to-end network uptime and who cannot afford to have the operation of their datacom network impaired by the failure of a DTE, a communications line, a modem or any other network component.

It is a computer-based service (comprising both software and hardware) which provides centralised, customer-controlled network facilities covering:

- Monitoring and surveillance
- Diagnostic testing and fault isolation
- Restoration
- Configuration control, and
- Database management.

The system is fully compatible with CCITT modems at data rates ranging from 1200 to 9600 bit/s, in any combination of asynchronous and synchronous circuit configurations.

With a total capacity of 1024 lines and 32,768 drop addresses, the system services large and small networks equally well. As the network size increases, the system can be readily expanded without making existing equipment obsolete, and usually with no disturbance to the on-line communication facilities. NDACS can also provide end-to-end Datel dial backup (using both automatic dialling and answering) for DDS services. This facility incorporates automatic line quality testing for optimum performance via the switched network.

AUSTPAC

AUSTPAC is a nationwide public packet switching data service. Packet switching can be defined as "the routing of data in discrete quantities called packets, each of controlled format and with a maximum size".

With this technique, circuits are not switched and dedicated to the user for the duration of a call. Instead, the packets are transmitted over logical links called virtual circuits, which emulate the facilities provided by a full duplex physical circuit.

Most teleprocessing applications are suitable for use with AUSTPAC, and it offers considerable cost and operational benefits where:

- Terminals need to access more than one host computer
- Users transmit small volumes of data over long distances
- Widely dispersed terminals access a common host computer in an interactive mode
- There is a need for communication between terminals with different characteristics (speed, code, protocol).

AUSTPAC has also been designed with the future in mind, and will support emerging applications such as electronic mail and electronic funds transfer.

Digital Data Service (DDS)

DDS uses a public digital data network specifically designed for data transmission. DDS offers 2400, 4800, 9600 and 48000 bit/s synchronous, leased line services which include point-to-point and multipoint facilities functionally similar to, and plug compatible with corresponding Datel Services.

In addition, two facilities which do not have Datel equivalents are also available – namely Netplex and Netstream. The Netplex service multiplexes data from a number of different terminal stations into a single 48 kbit/s stream that can be accepted directly by a central computer. Netstream is a pricing feature which allows two or more separate transmission streams occupying the same chargeable route, to be notionally aggregated into a higher-speed data stream for charging purposes. By using DDS, customers benefit from fast service provision, high reliability, enhanced network design flexibility, fast service restoration and its multiplexing capability.

Analogue Data Transmission on Telecom Voice Grade Dedicated Lines

Telecom Australia's Permitted Attachment Private Lines offer dedicated voice quality circuits as an alternative to the Datel service, to which customers may connect stand alone modems or terminal equipment with integrated modems for the purpose of Analogue Data Transmission.

Telecom is not responsible for the selection or maintenance of the private modems, or the performance of the derived data link. Testing will therefore be confined to measurement of the "analogue parameters" of the line to verify that they meet the guaranteed performance standards for Permitted Attachment Private Lines.

For electrical safety reasons, all devices including privately supplied modems (both integrated and stand alone) will require an "Authorisation to Connect", prior to connection to Telecom's networks.

10. CHARGING PRINCIPLES

Private Line Datel Service Charges

The charges for a Private Line Datel Service consist of:

- An annual rental for the modem
- An annual rental for the local loop (i.e. the line to the local exchange).
  The above charges are sometimes referred to in aggregate form as "Line Access Rental" and they apply to each line termination of a Datel Service.
- An annual rental for the leased line which is distance dependent and is charged on the basis of the radial distance between serving local exchanges; and
- "Once Only" installation fees for each Line Access and line.

Switched Network Datel Service Charges

The charges for a Switched Network Datel service consist of:

- An annual rental for the modem
- An annual rental for the exchange line (Business exchange line charges apply)
- Call charges (standard local and STD telephone charges apply to data transmission through the switched telephone network); and
- "Once Only" Installation Charges.

Other Miscellaneous Charges

Switched Network/Datel Private Line Connections

A range of charges apply for this facility. The charge is additional to the private line rental and varies depending on the number of exchange lines which have access to the private line at any one time.

Minimum Rental Period

The minimum period of agreement for all Data Services is 12 months current rental, and installation tariffs shall apply.

Temporary Services

Where a customer requires a Data Service for a period of less than 12 months, the service may be provided on a temporary basis. Special charges apply.

Cancellation of Service before 12 months

Where a customer agrees to lease a Data Service for the minimum period of 12 months and requests the cancellation of the service before the 12 months have expired the following charges will apply:

a. If the service is to be cancelled within 6 months of installation then temporary rates shall apply for the period of operation.
b. If the service is to be cancelled 6 months or more after installation then the full 12 months shall be charged for.

Alteration Charges

A comprehensive range of charges caters for alterations to Datel and other Telecom Data services. For further information contact your nearest Data Office.

A Datel Service Price List showing the current charges is available from the Data Office in your capital city.

11. CONNECTION OF PRIVATELY OWNED DATA EQUIPMENT TO DATEL SERVICES

Policy

Privately owned data equipment must be authorised by Telecom before connection to Datel Services. This authorisation ensures that the equipment meets the relevant specifications on electrical safety.

Authorisations

Authorisations are granted to the Supplier of the equipment who is also provided with special forms TS76 or TS83. These are made available to the customer for making application to connect the authorised equipment to the appropriate Datel Service.

For information on procedures, and technical specifications for authorisation of data equipment for connection to Datel Services contact:

Legal & Policy Branch
Regulatory Engineering Standards Section
Commercial Services Department
Telecom Australia Headquarters
18th Floor
199 William Street
MELBOURNE VIC 3000
Telephone: (03) 606 5770
Telex: Telecom AA30146

12. APPLYING FOR A DATEL SERVICE

The type of Datel Service you will require will depend on the facilities inherent in your data terminal equipment and on your data communication requirements.

Therefore, your equipment supplier should be able to advise you on the Datel Service best suited to your needs. Your DTE supplier must also provide you with a special form (either TS76 or TS83 – "Authority to Connect" forms) which will specify the required Datel Service facilities. This form, together with a Datel Application Form (TS68) which is available from the Data Office in your capital city or any TBO, should be forwarded to the Data Office in your capital city. Data Office locations are listed at the back of this booklet.

13. TELECOM'S ADVISORY AND PROFESSIONAL CONSULTANCY SERVICES

A free advisory service is readily available from the Telecom Data Offices in all capital cities to help you with advice or further information about any of our Data Services. Technical and commercial literature (Facilities Handbooks, Price Lists, etc.) on these Services is also available from the Data Offices which are listed at the back of this booklet.

In addition, Telecom offers a Professional Consultancy Service for customers seeking expert assistance in the planning and design of a new data communications network, or in the upgrading of an existing one. Initial enquiries for this service may be directed to the Data Office Staff.

A charge is levied for this professional service.

APPENDIX A.

The V24/RS-232-C Interface Connector Pin Assignments

25-Way Connector	CCITT Circuit No's	RS-232-C Equivalent	Circuit Name	To or from Modem
1	–	AA	NOT CONNECTED (Protective Ground)	
2	103	BA	Transmitted Data	To
3	104	BB	Received Data	From
4	105	CA	Request to Send	To
5	106	CB	Ready for Sending	From
6	107	CC	Data Set Ready	From
7	102	AB	Signal Ground (Common Return)	Common
8	109	CF	Data Channel Received Line Signal Detector	From
9	–	–	Reserved by Telecom	From
10	–	–	Reserved by Telecom	From
11	126	–	Select Transmit Frequency	To
12	122	SCF	Backward Channel Received Line Signal Detector	From
13	121	SCB	Backward Channel Ready	From
14	118	SBA	Transmitted Backward Channel Data	To
15	114	DB	Transmitter Signal Element Timing (synchronous service only)	From
16	119	SBB	Received Backward Channel Data	From
17	115	DD	Receiver Signal Element Timing (Synchronous services only)	From
18	141	–	Reserved by Telecom	To
19	120	SCA	Transmit Backward Channel	To
20	108.1	–	Connect Data Set to Line	To
	108.2	CD	Data Terminal Ready	To
21	110/140	CG	Reserved by Telecom	To/From
22	125	CE	Calling Indicator (A/A service)	From
23	111/112	CH/CI	Data Signalling Rate Selector (DTE/DCE Source)	To/From
24	113	DA	Transmitter Signal Element Timing (Synchronous service only)	To
25	142	–	Test indicator	From

APPENDIX B.

CCITT Recommendations

V.1	Equivalence between binary notation symbols and the significant conditions of a two-condition code
V.2	Power levels for data transmission over telephone lines
V.3	International Alphabet No. 5
V.4	General structure of signals of International Alphabet No. 5 code for data transmission in the general switched telephone network
V.5	Standardization of data-signalling rates for synchronous data transmission in the general switched telephone network
V.10(X.26)	Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications (and provisional amendments, May 1977)
V.11(X.27)	Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications (and provisional amendments, May 1977)
V.15	Use of acoustic coupling for data transmission
V.19	Modems for parallel data transmission using telephone signalling frequencies
V.20	Parallel data transmission modems standardised for universal use in the general switched telephone network
V.21	300 bit/s duplex modem standardised for use in the general switched telephone network
V.22	1200 bit/s modem standardised for use on the general switched telephone network and on leased circuits
V.22 bis	2400 bit/s modem standardised for use on the general switched telephone network and on two-wire leased circuits
V.23	600/1200-baud modem standardised for use in the general switched telephone network
V.24	List of definitions for interchange circuits between data terminal equipment and data circuit-terminating equipment (and provisional amendments, May 1977)
V.25	Automatic calling and/or answering equipment on the general switched telephone network, including disabling of echo suppressors on manually established calls.
V.25 bis	Automatic calling and/or answering equipment on the general switched telephone network using 100-series interchange circuits.
V.26	2400 bit/s modem standardised for use on four-wire leased circuits
V.26 bis	2400/1200 bit/s modem standardised for use in the general switched telephone network
V.27	4800 bit/s modem standardised for use on leased circuits
V.27 bis	4800 bit/s modem with automatic equalizer standardised for use on leased circuits
V.27 ter	4800/2400 bit/s modem standardised for use in the general switched telephone network
V.28	Electrical characteristics for unbalanced double-current interchange circuits
V.29	9600 bit/s modem for use on leased circuits
V.31	Electrical characteristics for single-current interchange circuits controlled by contact closure
V.35	Data transmission at 48 kilobits per second using 60-108-kHz group-band circuits
V.36	Modems for synchronous data transmission using 60-108-kHz group-band circuits
V.54	Loop test devices for modems (and provisional amendments, May 1977)
X.1	Intrnational user classes of service in public data networks
X.2	International user facilities in public data networks

X.3	Packet assembly/disassembly facility (PAD) in a public data network
X.4	General structure of signals of International Alphabet No. 5 code for data transmission over public data networks
X.20	Interface between data terminal equipment and data circuit-terminating equipment for start-stop transmission services in public data networks
X.20 bis	V.21 – compatible interface between data terminal equipment and data circuit terminating equipment for start-stop transmission services on public data networks
X.21	General purpose interface between data terminal equipment and data circuit-terminating equipment for synchronous operation on public data networks
X.21 bis	An interface to enable DTEs designed to work with CCITT V series synchronous modems to be directly connected to the digital data network
X.24	List of definitions of interchange circuits between data terminal equipment and data circuit-terminating equipment on public data networks
X.25	Interface between data terminal equipment and data circuit-terminating equipment for terminals operating in the packet mode on public data networks (and provisional amendment, April 1977)
X.26	Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications (identical to V.10)
X.27	Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications (identical to V.11)
X.28	DTE/DCE interface for a start/stop mode data terminal equipment accessing the packet assembly/disassembly facility (PAD) on a public data network situated in the same country
X.29	Procedures for exchange of control information and user data between a packet mode DTE and a packet assembly/disassembly facility (PAD)
X.92	Hypothetical reference connections for public synchronous data networks
X.95	Network parameters in public data networks
X.96	Call progress signals in public data networks

APPENDIX C.

Datel Leased Line Modems
Modem Reponse Times and Propagation Delay Times

CCITT Recommendation	Modem Type	Circuit 106 Off to On (ms) (RFS)	One-Way Propagation Delay Through Modem (ms)
V.21	200/300 bit/s	20 – 50	3 – 4
V.23	600/1200 bit/s	20 – 40	3 – 4
V.26	2400 bit/s	25 – 45	3 – 9
V.27	4800 bit/s	50 or 708	7.5 – 10
—	4800 bit/s (SH modem)	<20	0.5
V.29	9600 bit/s	253.5 ± 0.5	8 – 9
V.29 (MUX)*	9600 bit/s	253.5 ± 0.5 or 15 ± 5 (Simulated control carrier)	10 – 16

*V.29 with built-in 4-port multiplexer

NOTE 1-Modems may be configured for permanent carrier operation for point-to-point application

NOTE 2-Some modems offer a dummy RTS – RFS facility

GLOSSARY OF TELECOMMUNICATION TERMS

Acoustic Coupler

A device which allows the data to be transmitted via a terminal over the public switched telephone network, using a normal voice telephone handset.

Alternate Routing

A network facility that allows data to have at least two routes to reach its destination. Although the shortest route would normally be used for transmission, alternate routing allows such problems as overloading or breakdown in the network to be circumvented.

Amplitude Modulation(AM)

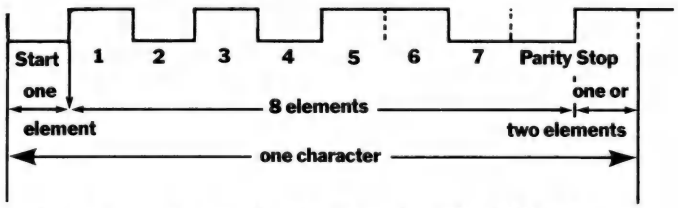
A means of transmitting information by varying the amplitude of a carrier wave. Example: AM radio broadcasting.

Analogue Transmission

The means of transmission of information where the transmitted waveform is continously varying in some key characteristic in line with the incoming information. This is the usual method of transmission using voice telephone lines.

Asynchronous Transmission

Term used to describe the transmission method where both send and receive terminals have independent timing. Each string of information bits e.g. a character, is preceded by a start bit and concluded by one or more bits acting as an end of character (Character-stop) indication. It is typically used at relatively low transmission speeds (up to 1200 bit/s).



Asynchronous transmission of the character "5" in ASCII code

ASCII

American Standard Code for Information Interchange. A seven-bit code adopted by the American National Standard Institute (ANSI). This code is a subset of the CCITT International Alphabet No. 5.

Attenuation

The loss of signal strength resulting from its transmission over a line. Attenuation varies with frequency unlike the more familiar entity, electrical resistance.

Automatic Answering

System of direct connection to a computer system via the Public Switched Telephone Network, whereby standard tones are used to signal to a user when a satisfactory connection has been made, so that data transmission can commence.

Automatic Calling

The process of dialling without manual intervention. Terminals may, for example, be dialled directly by the computer system. Also known as Automatic Dialling.

Backward Channel

A low-speed data transmission channel usually used for supervisory and/or error control functions, and associated with the forward channel. Usually has a direction of transmission opposite to that in which information is being transferred.

Bandwidth of a Channel

Describes the capacity of a communication channel and is expressed as the difference between the lowest and highest frequencies over which transmission can take place. It should not be confused with frequency of transmission.

Base Band Transmission

Base band signals are DC signals produced by terminal equipment and are usually square wave pulses. Transmission of these original signals without modulation is base band transmission.

Baud

The Baud Rate of a communication channel is the rate at which the line signal is modulated. It is the same as bit rate for many transmission systems, but may be higher or lower in others

Binary

Term used to describe any system based on two values or attributes. The binary number system has a base of two and is built entirely from two elements "0" and "1". Because many electrical circuits have binary elements (e.g. ON and OFF), binary systems are favoured for electronic computers.

BIT

Abbreviation for "binary digit", but widely used and accepted as a word on its own to express a single element of information, either a "0" (zero) or a "1" according to binary notation.

BITS Per Second

The commonly used measure for data transfer rate. Often expressed as bps, b.p.s. or BPS, but more correctly as bit/s.

Broadband (Wide Band) Data Transmission

Broadband systems typically are carrier systems having a bandwidth of 4 MHz or more, from which multiple single channels are electronically derived.

Buffer

A device used for temporary storage of data, primarily to compensate for differences in data flow rates (for example, between a terminal and its transmission line), but also as a security measure to allow re-transmission

of data if an error during transmission is detected.

Byte

A sequence of binary digits operated upon as a unit, and typically representing a character. Common usage refers to 8-bit bytes.

Carrier Wave

A single, high-fixed frequency sinusoidal wave which is modulated by a signal waveform representing information to be transmitted.

CCITT

The International Telegraph and Telephone Consultative Committee (CCITT) is one of the three principal components of the International Telecommunications Union (ITU) which is affiliated with the United Nations Organisation. The CCITT studies and makes recommendations concerning technical, operational and tariff aspects of international telephone, telegraph and data communications.

Channel

In strict telecommunications terminology, a channel is the physical facility for allowing one-way transmission. This may be a line or a radio link. To allow two-way transmissions, therefore, two channels are required (making a "circuit" – see below). However, in common usage, channel is loosely used to describe any link allowing data transmission, such as a telephone line, a circuit, etc. It should be noted also that the telecommunications use of the word "channel" differs from the meaning ascribed to it in data processing, where it describes the device attached to the central processing unit handling the movement of data in and out of the machine.

Character

An element of a code which has been allotted a specific meaning such as a digit, letter or special symbol.

Circuit

Electrical path between two or more points capable of providing both-way communication.

Circuit Switching

The method of establishing a route for communication whereby a complete link between the calling and receiving stations is set up and maintained exclusively for the exchange of information between those two stations, until one of them breaks off transmission or reception. The circuit is dedicated to the particular link established, independent of the actual use made of that link while the connection is maintained.

Concentrator

A device that allows data transmitted on a number of lines to be combined and re-transmitted on fewer lines usually at a higher data signalling rate.

Conditioning

A technique for cancelling the signal loss resulting from attenuation and other causes on private lines. This technique is no longer required for Datel services owing to the technically advanced modems currently in use.

Connect Time

The elapsed period from the instant a terminal user makes connection with a remote computer to breaking off the connection on completion of his task. During this period the user may not have been continuously transmitting or receiving data, but the connection will have been kept open in readiness and will have been monitored constantly by the computer.

Contention

A procedure of line control whereby a terminal with data to send seizes the line and commences transmission. Where more than one terminal is attached to one line, collisions will occur if two or more terminals simultaneously contend for the line. Some quite elaborate procedures are adopted to overcome this problem.

Control Station

See Instation.

CRT

Abbreviation for cathode ray tube and used to describe a display screen terminal or a VDU (visual display unit).

Data Link

A communication system suitable for transmission of data between terminal equipment.

Data Set

In data communications, this term is generally synonymous with a modem, that is, a device which allows a digital terminal device to transmit and receive data over an analogue communication channel. However, the term is often used also to describe a limited file of data, especially when referring to data processing.

Data Circuit-Terminating Equipment (DCE)

The equipment installed at the user's premises which provides all the functions required to establish, maintain and terminate a connection, and to perform signal conversion and coding between the data terminal equipment (DTE), the interface and the line (e.g. a modem). It may be either a specific or separate piece of equipment.

Data Communication

The movement of information in coded form over an electrical transmission system. Typically, data communication is based on characters which are represented as distinct elements within specified codes. While having similarities with telegraphy, data communication usually involves some form of data processing either before or after transmission.

Data Terminal Equipment (DTE)

The terminals or computers that are connected to the modem.

Datel

The generic name for a range of Telecom Australia data transmission services comprising analogue transmission on telephone lines, the provision of modems and end-to-end maintenance support.

Demodulation (Also see Modulation)

Process of recovering the information signal from the modulated waveform that was transmitted.

Digital Transmission

The means of transmission where the signal consists of discrete separate pulses or signal levels. Digital techniques are now being increasingly used for the transmission of speech (using Pulse Code Modulation).

Distortion

An undesired change in waveform.

DPL

Datel Private Line services are also known as leased line services.

DXL

Datel Exchange Line services are also known as Switched Network Services.

Echo

Wave which has been reflected or otherwise returned with sufficient magnitude and delay to be perceived. Usually occurs in transmission circuits due to impedance mismatch, and can seriously affect data transmission.

Echo Suppressors

A device for use in a two-way telephone channel (especially International Circuits) to attenuate echo currents in one direction caused by telephone currents in the other direction. A device which suppresses echoes would also suppress data, and so, when full duplex transmission is used the echo suppressors must be disabled. This can be done by sending an appropriate disabling tone to the line.

Electronic Industries Association (EIA)

A group composed of electronic equipment manufacturers in the USA, which proposes industry-wide standards for hardware and interfaces for use in that country. Because of the prominence of USA manufacturers in the computer market EIA standards frequently have global impact.

Equalization

A balancing technique to compensate for distortions present on a communication channel.

Facsimile (FAX)

Transmission of pictures, maps, diagrams, etc. The image is scanned at the transmitter, and reconstructed on paper at the receiving station.

Forward Channel

A channel in which the direction of data transmission coincides with the direction of information transfer.

Frequency Division Multiplexing (FDM)

A multiplex system in which the available transmission frequency range is divided into narrower bands, each used for a separate channel.

Frequency Modulation (FM)

Modulation in which the frequency of an alternating current is the characteristic varied.

Half-Duplex Circuit

Circuit which permits only one direction of electrical communications between stations at one time.

Hertz (Hz)

The unit of frequency meaning cycles per second.

High-Level Data Link Control (HDLC)

A protocol specified by ISO for data transmission between two points. It incorporates error flow control.

Impulse Noise

A form of distortion characterised by high amplitude and short duration (peaks).

Instation

Usually refers to the location of the computer (to distinguish from Outstations – the terminal locations).

Interface

A concept involving the specification of the interconnection between two pieces of equipment having different functions. The specification of the type, quantity, and function of the interconnection circuits, and the type and form of signals to be interchanged via those circuits.

ISO

International Standards Organisation.

International Telecommunication Union (ITU)

International organisation established to provide standardised communications procedures and practices including frequency allocation for radio, telegraph and telephone regulations on an international basis.

Loop

1) Local Loop. The physical connection between the telephone exchange and the customer's premises.
2) Loop Network. A type of data network in which a uni-directional data flow through a variety of lines and equipment is established.

Message Switching

The switching technique of receiving a message, storing it until the proper outgoing circuit and station are available and then retransmitting it toward its destination.

Modulation (See also Demodulation)

Process by which certain characteristics of a wave are modified in accordance with a characteristic of another wave or a signal.

Noise

Noise is any undesired sound. By extension, noise is any unwanted disturbance within a useful frequency band, such as undesired electrical waves in any transmission channel or device.

Off-Line

Pertaining to equipment or devices not under direct control of the central processing unit. May also be used to describe terminal equipment not connected to a transmission link.

One-way Communication

Data communication in which information is transferred in one pre-assigned direction (ie. Simplex).

Outstation

Usually refers to the location of the terminal equipment (to distinguish from Instation – the computer location).

Parallel Transmission

The simultaneous transmission over several identical channels of the signal elements constituting the same telegraph or data signal. Contrast with serial transmission.

Parity

Parity involves adding one extra non-information bit to each group of bits in a code, so that the number of ones in the resulting group is either always even (even parity) or always odd (odd parity). An error in transmission which results in a change in a single bit can be detected by the receiver, and action taken to correct the error.

Phase Modulation

Method of modulation where the amplitude of the modulated wave remains constant while varying in phase under the influence of the modulating signal.

Polling

A centrally controlled method of calling a number of terminals in sequence to permit them to transmit information.

Propagation Time

The time required for a data signal to be transferred from the DTE/DCE interface at one end of the circuit to the interface at the other end of the circuit. The delay is made up of the delay in modems, equalisers, filters and other facilities, as well as the time taken for the signal to travel over the circuit.

Protocol

The rules or procedures for the control of communications over a channel. Protocols are required for bit synchronisation, so that the receiver knows when a bit starts and ends so that it can be sampled; for character synchronisation, so that the receiver can determine which bits belong to a character; and message synchronisation, so that the receiver can recognise the special character sequences which delineate messages. Typical protocols incorporate the blocking of transmission into messages employing start-of-text and end of text (STX/ETX) or other similar markers and a positive/negative acknowledgement procedure (ACK/NAK). Error detection and correction is provided by a variety of means which require additional non-data information to be transmitted.

PSTN

Public Switched Telephone Network.

Pulse Code Modulation (PCM)

Modulation of a pulse train in accordance with a code.

Real Time

a. Pertaining to the actual time during which a physical process takes place.
b. Pertaining to the performance of a computation during a period, short in comparison with the actual time that the related physical process takes place in order that results of the computations can be used in guiding the physical process.

Response Time

The amount of time elapsed between generation of an inquiry at a data communications terminal and receipt of a response at that same terminal. Response time, thus defined, includes:
Transmission time to the computer, processing time at the computer, including access time to obtain any file records needed to answer that inquiry, and transmission time back to the terminal.

Serial Transmission

A method of information transfer in which the bits comprising a character are sent sequentially. Contrast with parallel transmission.

Signal

In communication theory, an intentional disturbance in a communication system. Contrast with noise.

Store-and-Forward Transmission

See message switching system.

Strapping

Term used to denote the setting of switches etc. in a device to provide a particular set of optional facilities.

Synchronous Transmission

Term used to describe the transmission method where both send and receive terminals are synchronised. Because of this synchronisation, synchronous transmission can be used to send data without start or stop bits (see Asynchronous Transmission) and with no pause between characters. Greater volumes of data may therefore be transmitted in a given time than with asynchronous transmission.

Telegraphy

A branch of telecommunications which is concerned with the movement of information in coded form over an asynchronous two state signalling system. Usually applies to low speed information transfer up to 75 bit/s.

Telephony

A system of telecommunication set up for the transmission of voice or, in some cases, other sounds.

Time Division Multiplexing (TDM)

Time division multiplexing is a process whereby a channel which is capable of relatively high information transfer rate (in bit/s) is divided up into a number of time slots to provide a number of lower speed channels. The full bandwidth of the channel is available to be used during each time slot so that the effect is very similar to that obtained by frequency division multiplexing. It will be noticed that in multiplexing there is no "contention" ie. the number of inputs is the same as the number of outputs. This is the primary difference between concentrating and multiplexing.

Time Sharing

A method of operation in which a computer facility is shared by several users for different purposes at (apparently) the same time. Although the computer actually services each user in sequence, the high speed of the computer makes it appear that the users are all handled simultaneously.

Turnaround Time

The actual time required to reverse direction of transmission from send to receive or vice versa on a half-duplex circuit. Usually referred to as modem turnaround.

VDU

See CRT.

Voice Grade Channel

Term used to describe a channel which is 4000 Hz wide and capable of carrying speech signals in the range of 300-3400 Hz. Such a channel can, however, carry analogue or digital data, with a maximum rate of about 20 kbits per second.

Wideband

(See "Broadband.")

TELECOM STATE DATA OFFICES

NSW: Business Sales Section
Commercial Department
16th Floor, Telecom House
157 Liverpool Street
SYDNEY NSW 2000
Telephone: (02) 267 6767

VIC: Sales Administration
Commercial Department
1st Floor
219 Elizabeth Street
MELBOURNE VIC 3000
Telephone: (03) 605 5099

QLD: Business Networks Branch
Operations Department
5th Floor
40 Creek Street
BRISBANE QLD 4000
Telephone: (07) 835 6400

SA: Business Systems Branch
Operations Department
6th Floor, Standard Chartered Building
26 Flinders Street
ADELAIDE SA 5000
Telephone: (08) 230 4122

WA: Business Networks Branch
Operations Department
1st Floor
251 St. Georges Terrace
PERTH WA 6000
Telephone: (09) 420 7477

TAS: Business Systems Branch
Operations Department
1st Floor
80 Elizabeth Street
HOBART TAS 7000
Telephone: (002) 20 8800

ACT: Telegraphs and Data Section
Operations Department
2nd Floor
496 Northbourne Avenue
DICKSON ACT 2602
Telephone: (062) 45 5555

NT: District Telecommunications Branch
Operations Department
1st Floor, Hooker Building
47 Mitchell Street
DARWIN NT 5790
Telephone: (089) 89 3266

Authorisations:
Regulatory Branch
Legal and Policy Division
Commercial Services Department
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2376/87 – Issued Jun. 87